FIG. 1

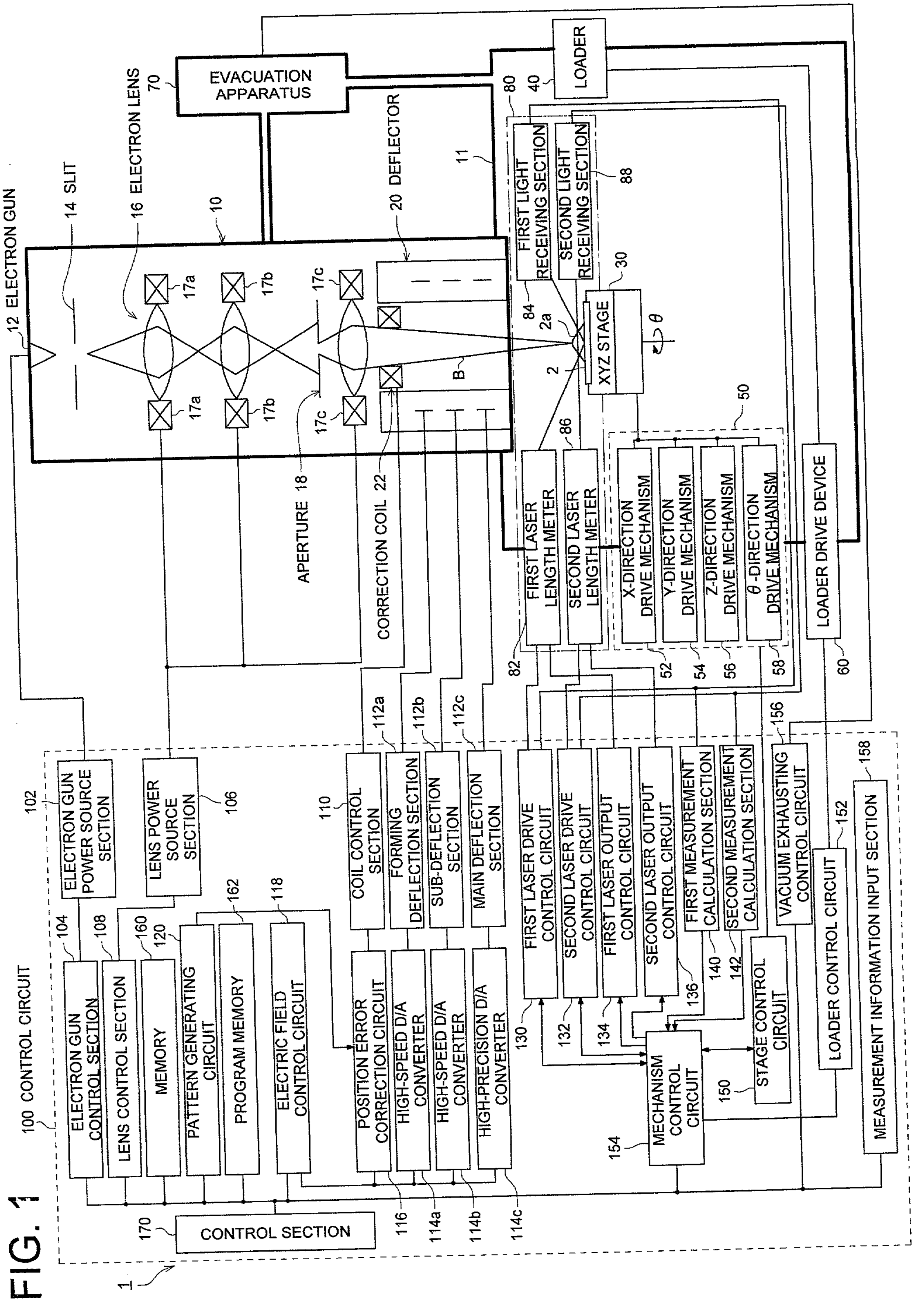

1
100 CONTROL CIRCUIT
12 ELECTRON GUN
14 SLIT
16 ELECTRON LENS
10
20 DEFLECTOR
11
70
EVACUATION APPARATUS
80
40
LOADER
17a
17b
17c
2a
84
FIRST LIGHT RECEIVING SECTION
SECOND LIGHT RECEIVING SECTION
88
30
XYZ STAGE
θ
B
2
86
50
APERTURE 18
CORRECTION COIL 22
FIRST LASER LENGTH METER
SECOND LASER LENGTH METER
X-DIRECTION DRIVE MECHANISM
Y-DIRECTION DRIVE MECHANISM
Z-DIRECTION DRIVE MECHANISM
θ-DIRECTION DRIVE MECHANISM
LOADER DRIVE DEVICE
82
52
54
56
58
60
102
ELECTRON GUN POWER SOURCE SECTION
LENS POWER SOURCE SECTION
106
110
COIL CONTROL SECTION
112a
FORMING DEFLECTION SECTION
112b
SUB-DEFLECTION SECTION
112c
MAIN DEFLECTION SECTION
FIRST LASER DRIVE CONTROL CIRCUIT
SECOND LASER DRIVE CONTROL CIRCUIT
FIRST LASER OUTPUT CONTROL CIRCUIT
SECOND LASER OUTPUT CONTROL CIRCUIT
FIRST MEASUREMENT CALCULATION SECTION
SECOND MEASUREMENT CALCULATION SECTION
156
VACUUM EXHAUSTING CONTROL CIRCUIT
152
LOADER CONTROL CIRCUIT
158
MEASUREMENT INFORMATION INPUT SECTION
104
ELECTRON GUN CONTROL SECTION
108
LENS CONTROL SECTION
160
MEMORY
120
PATTERN GENERATING CIRCUIT
162
PROGRAM MEMORY
118
ELECTRIC FIELD CONTROL CIRCUIT
POSITION ERROR CORRECTION CIRCUIT
HIGH-SPEED D/A CONVERTER
HIGH-SPEED D/A CONVERTER
HIGH-PRECISION D/A CONVERTER
130
132
134
136
140
142
STAGE CONTROL CIRCUIT
150
MECHANISM CONTROL CIRCUIT
154
170
CONTROL SECTION
116
114a
114b
114c

FIG. 2 (A)

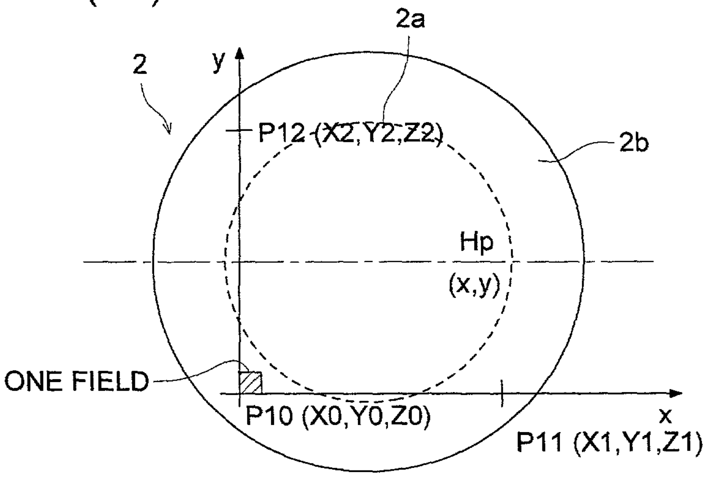


FIG. 2 (B)

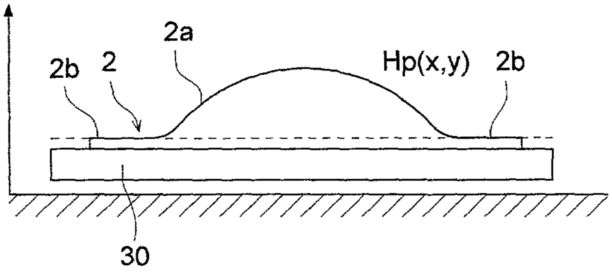


FIG. 2 (C)

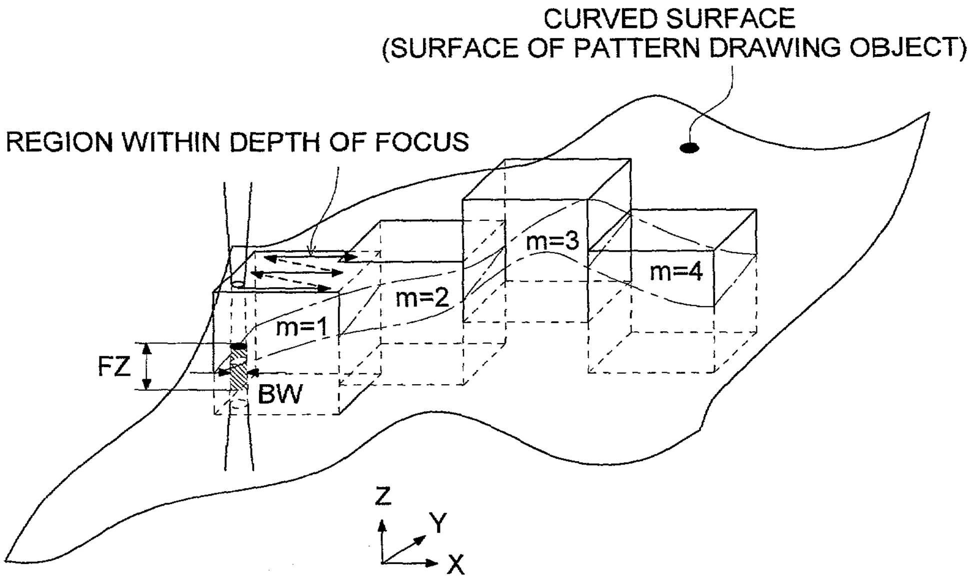


FIG. 3

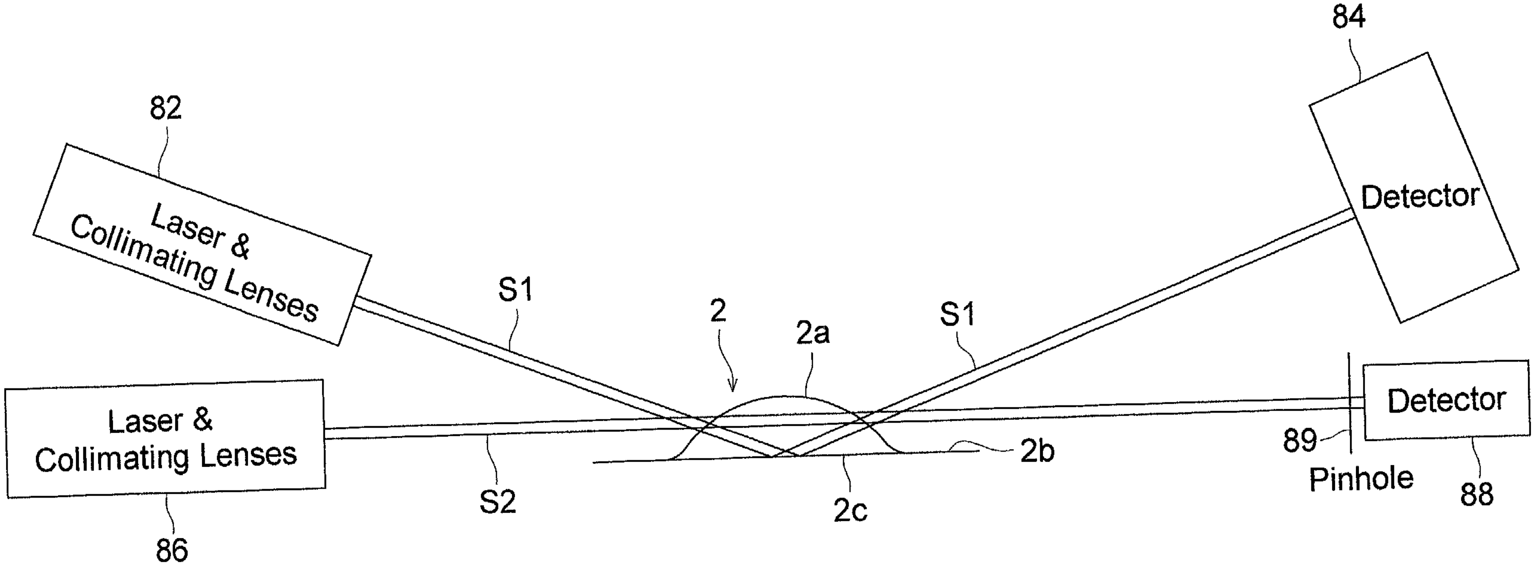

82
Laser & Collimating Lenses
S1
2
2a
S1
84
Detector
Laser & Collimating Lenses
86
S2
2b
2c
Detector
89
Pinhole
88

FIG. 4

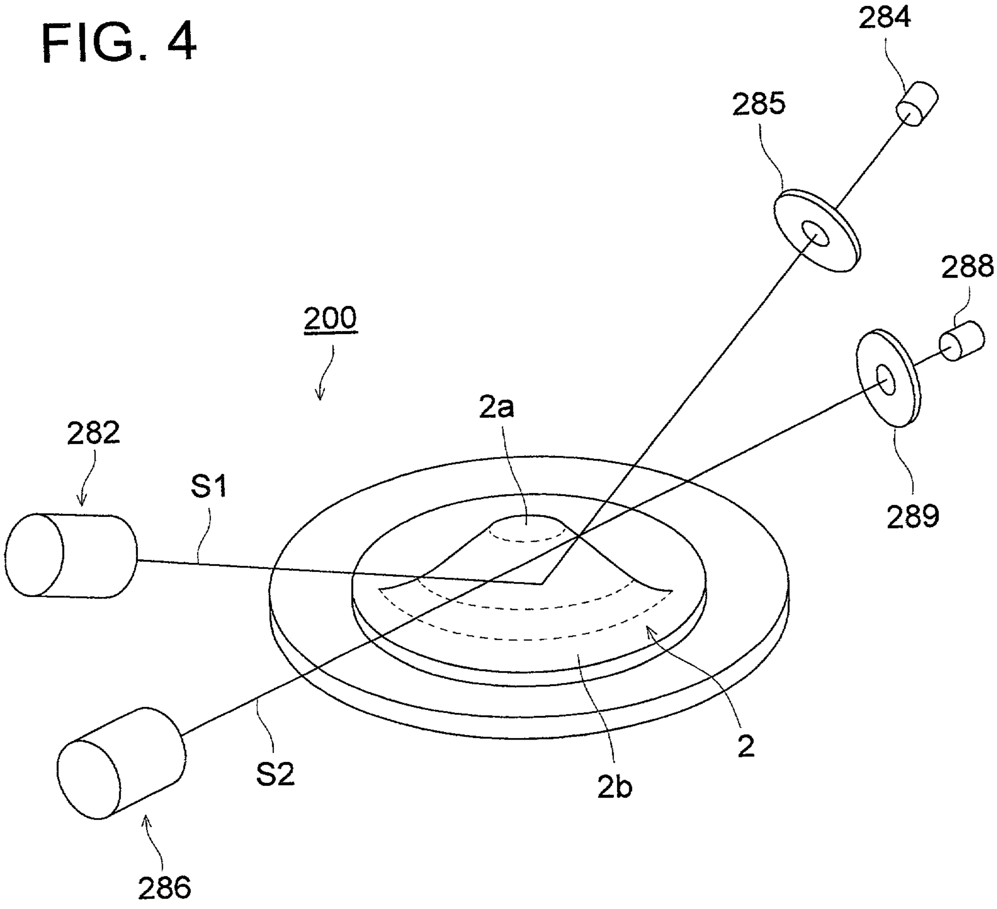


FIG. 5 (A)

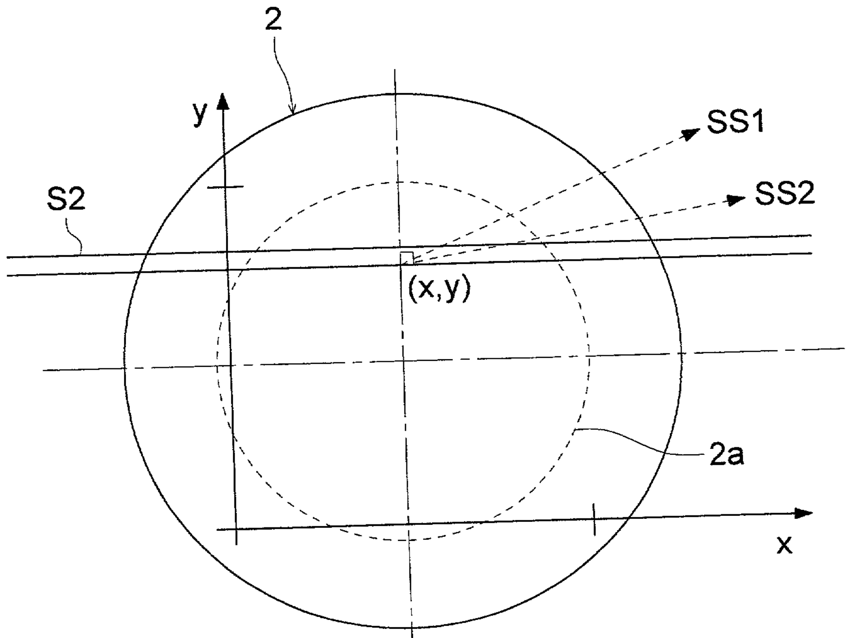


FIG. 5 (B)

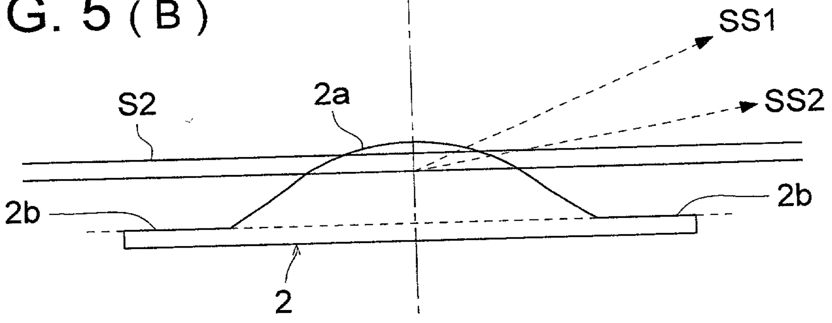


FIG. 5 (C)

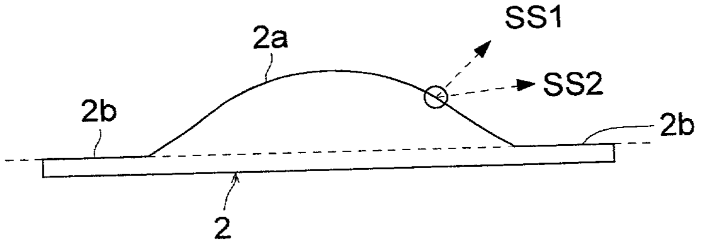


FIG. 6

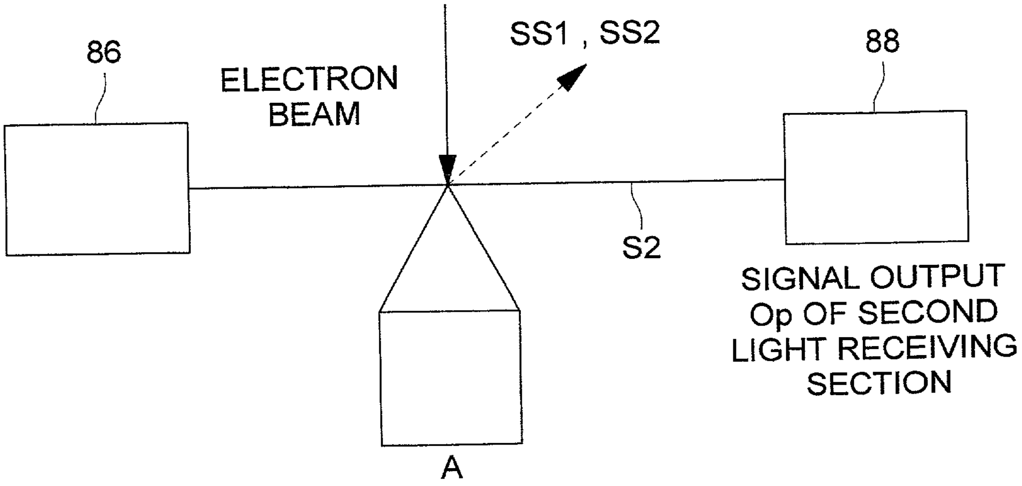

86
ELECTRON BEAM
SS1 , SS2
88
S2
SIGNAL OUTPUT Op OF SECOND LIGHT RECEIVING SECTION
A

FIG. 7

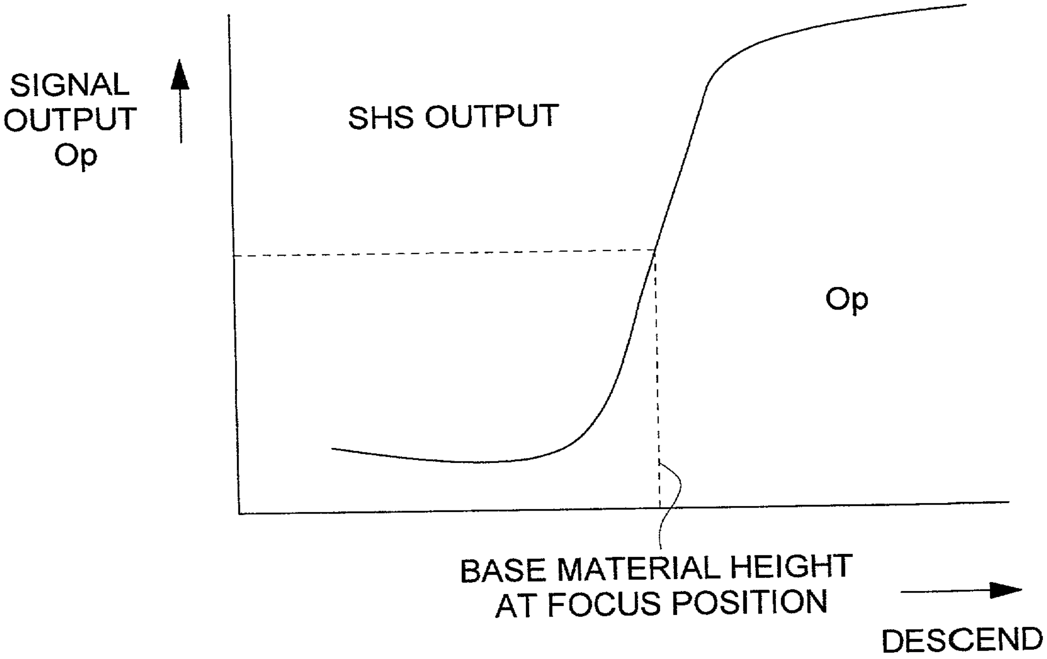

SIGNAL OUTPUT Op
SHS OUTPUT
Op
BASE MATERIAL HEIGHT AT FOCUS POSITION
DESCEND

FIG. 8

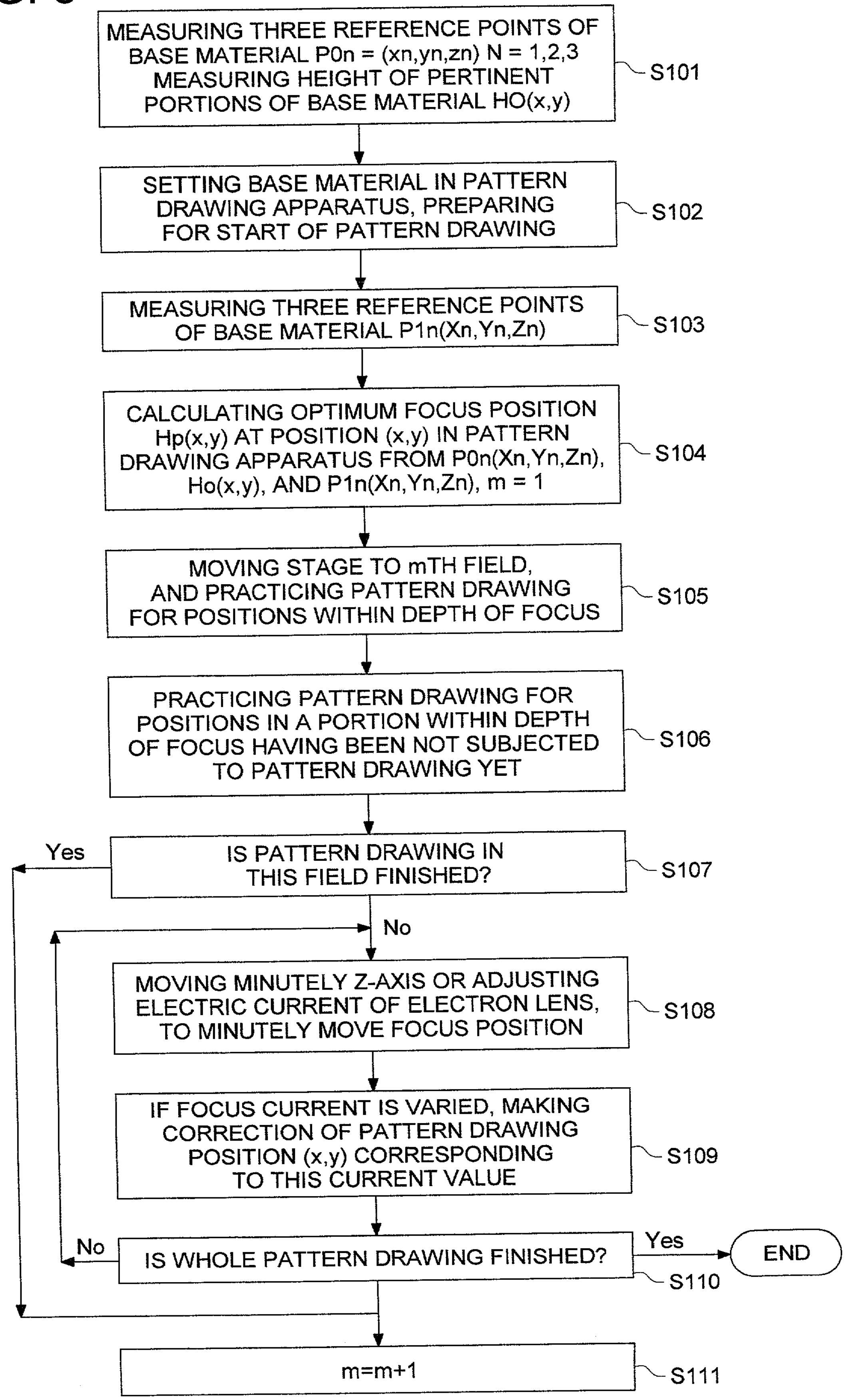

MEASURING THREE REFERENCE POINTS OF BASE MATERIAL P0n = (xn,yn,zn) N = 1,2,3 MEASURING HEIGHT OF PERTINENT PORTIONS OF BASE MATERIAL HO(x,y)
S101
SETTING BASE MATERIAL IN PATTERN DRAWING APPARATUS, PREPARING FOR START OF PATTERN DRAWING
S102
MEASURING THREE REFERENCE POINTS OF BASE MATERIAL P1n(Xn,Yn,Zn)
S103
CALCULATING OPTIMUM FOCUS POSITION Hp(x,y) AT POSITION (x,y) IN PATTERN DRAWING APPARATUS FROM P0n(Xn,Yn,Zn), Ho(x,y), AND P1n(Xn,Yn,Zn), m = 1
S104
MOVING STAGE TO mTH FIELD, AND PRACTICING PATTERN DRAWING FOR POSITIONS WITHIN DEPTH OF FOCUS
S105
PRACTICING PATTERN DRAWING FOR POSITIONS IN A PORTION WITHIN DEPTH OF FOCUS HAVING BEEN NOT SUBJECTED TO PATTERN DRAWING YET
S106
Yes
IS PATTERN DRAWING IN THIS FIELD FINISHED?
S107
No
MOVING MINUTELY Z-AXIS OR ADJUSTING ELECTRIC CURRENT OF ELECTRON LENS, TO MINUTELY MOVE FOCUS POSITION
S108
IF FOCUS CURRENT IS VARIED, MAKING CORRECTION OF PATTERN DRAWING POSITION (x,y) CORRESPONDING TO THIS CURRENT VALUE
S109
No
IS WHOLE PATTERN DRAWING FINISHED?
Yes
END
S110
m=m+1
S111

FIG. 9

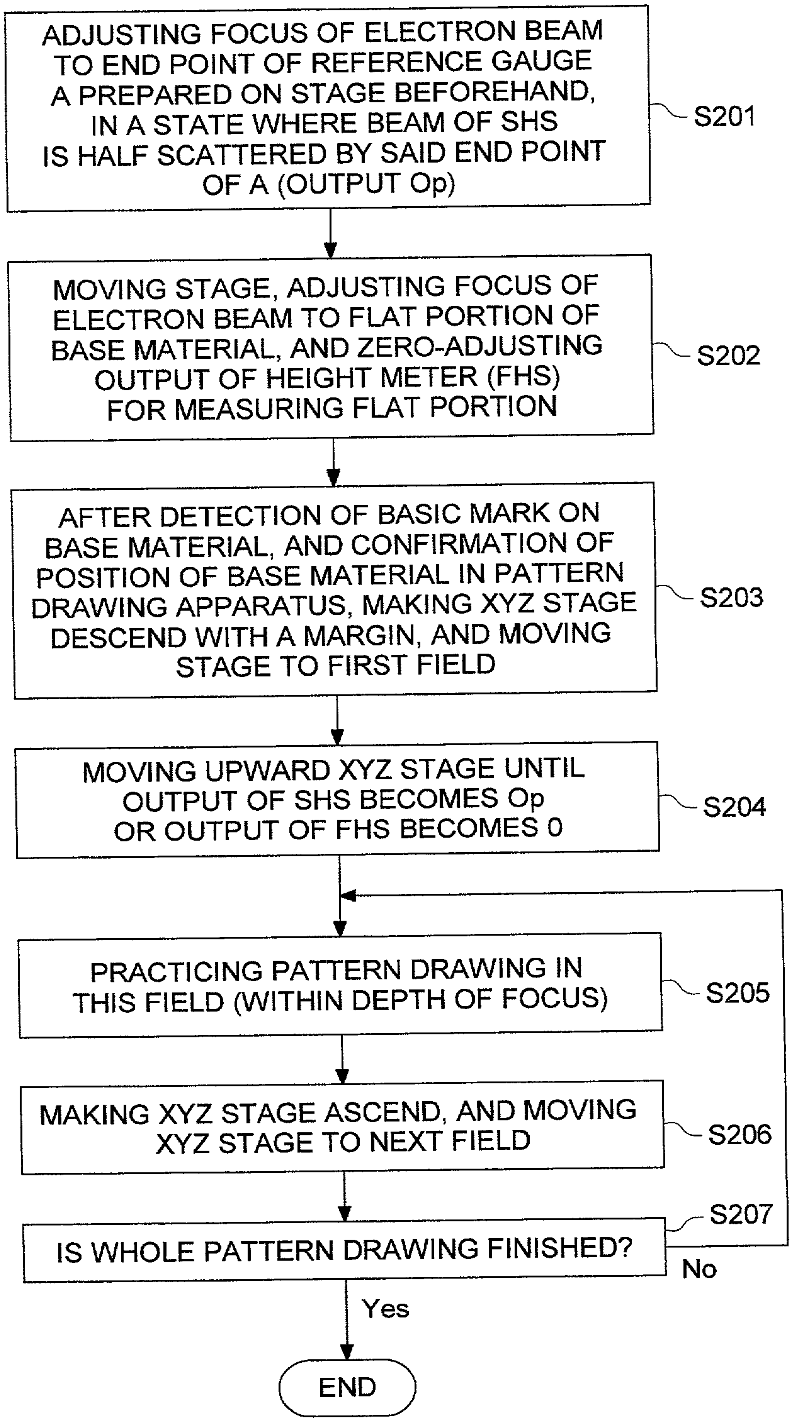

ADJUSTING FOCUS OF ELECTRON BEAM TO END POINT OF REFERENCE GAUGE A PREPARED ON STAGE BEFOREHAND, IN A STATE WHERE BEAM OF SHS IS HALF SCATTERED BY SAID END POINT OF A (OUTPUT Op)
S201
MOVING STAGE, ADJUSTING FOCUS OF ELECTRON BEAM TO FLAT PORTION OF BASE MATERIAL, AND ZERO-ADJUSTING OUTPUT OF HEIGHT METER (FHS) FOR MEASURING FLAT PORTION
S202
AFTER DETECTION OF BASIC MARK ON BASE MATERIAL, AND CONFIRMATION OF POSITION OF BASE MATERIAL IN PATTERN DRAWING APPARATUS, MAKING XYZ STAGE DESCEND WITH A MARGIN, AND MOVING STAGE TO FIRST FIELD
S203
MOVING UPWARD XYZ STAGE UNTIL OUTPUT OF SHS BECOMES Op OR OUTPUT OF FHS BECOMES 0
S204
PRACTICING PATTERN DRAWING IN THIS FIELD (WITHIN DEPTH OF FOCUS)
S205
MAKING XYZ STAGE ASCEND, AND MOVING XYZ STAGE TO NEXT FIELD
S206
IS WHOLE PATTERN DRAWING FINISHED?
S207
No
Yes
END

FIG. 10

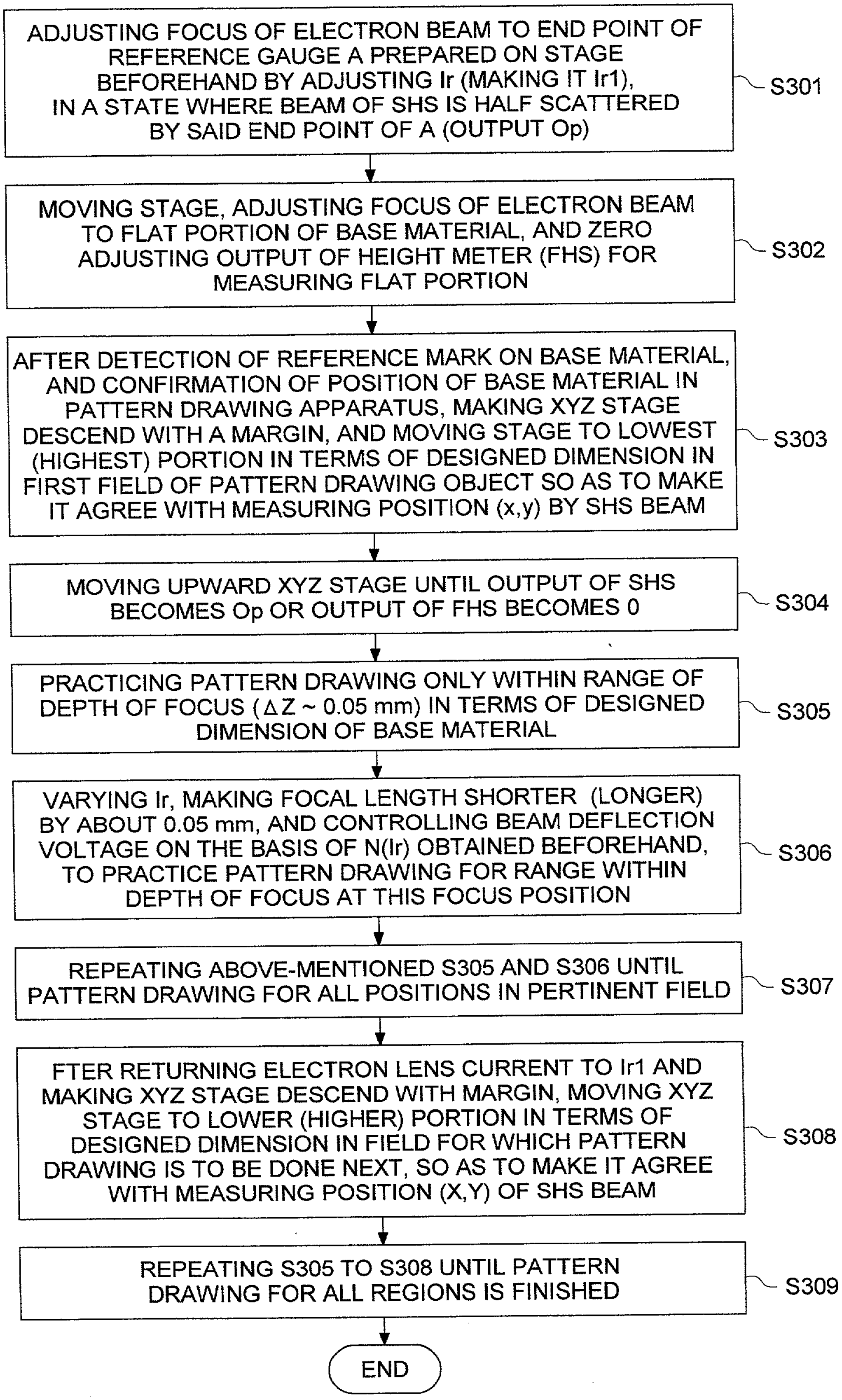
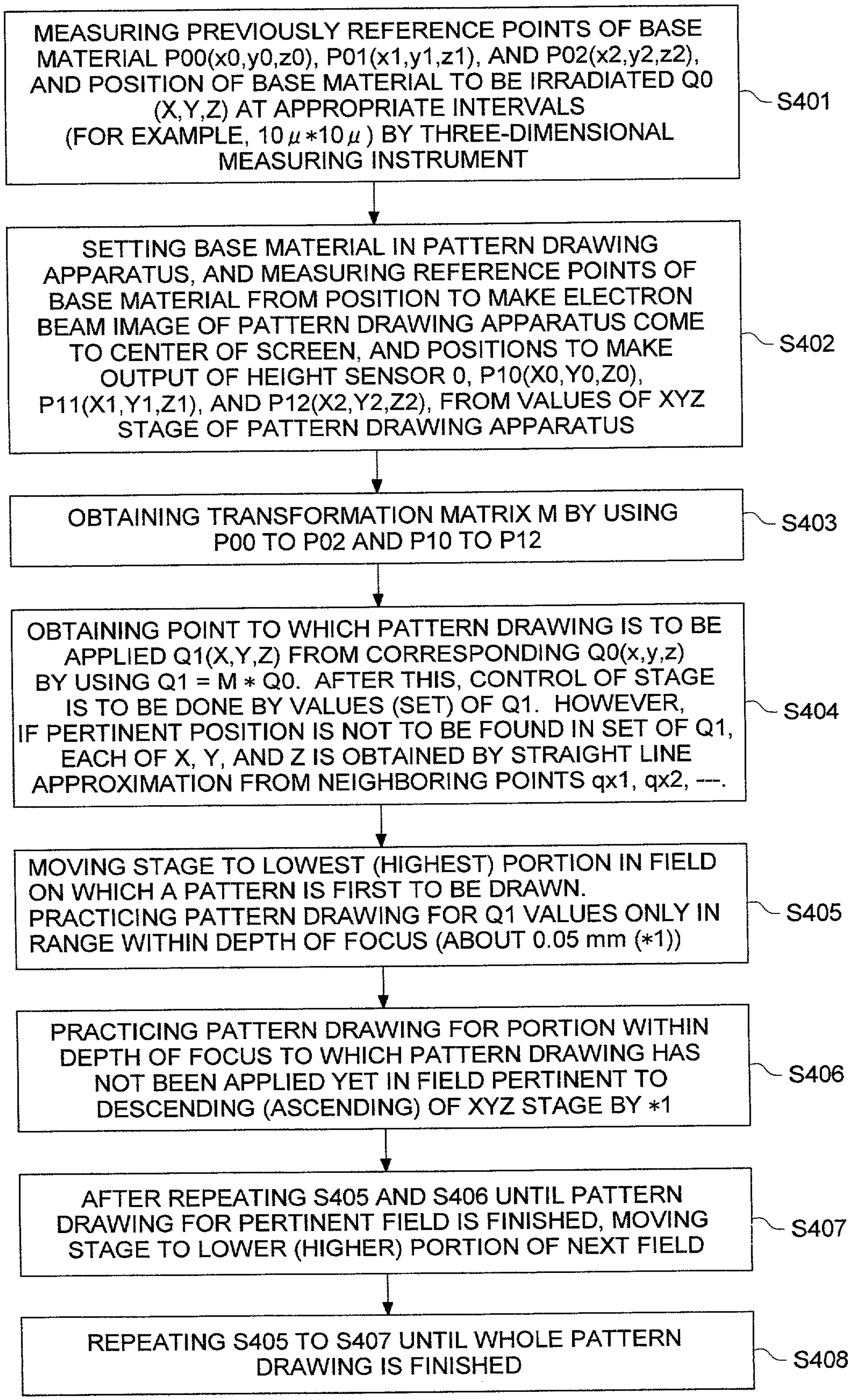

ADJUSTING FOCUS OF ELECTRON BEAM TO END POINT OF REFERENCE GAUGE A PREPARED ON STAGE BEFOREHAND BY ADJUSTING Ir (MAKING IT Ir1), IN A STATE WHERE BEAM OF SHS IS HALF SCATTERED BY SAID END POINT OF A (OUTPUT Op)
S301
MOVING STAGE, ADJUSTING FOCUS OF ELECTRON BEAM TO FLAT PORTION OF BASE MATERIAL, AND ZERO ADJUSTING OUTPUT OF HEIGHT METER (FHS) FOR MEASURING FLAT PORTION
S302
AFTER DETECTION OF REFERENCE MARK ON BASE MATERIAL, AND CONFIRMATION OF POSITION OF BASE MATERIAL IN PATTERN DRAWING APPARATUS, MAKING XYZ STAGE DESCEND WITH A MARGIN, AND MOVING STAGE TO LOWEST (HIGHEST) PORTION IN TERMS OF DESIGNED DIMENSION IN FIRST FIELD OF PATTERN DRAWING OBJECT SO AS TO MAKE IT AGREE WITH MEASURING POSITION (x,y) BY SHS BEAM
S303
MOVING UPWARD XYZ STAGE UNTIL OUTPUT OF SHS BECOMES Op OR OUTPUT OF FHS BECOMES 0
S304
PRACTICING PATTERN DRAWING ONLY WITHIN RANGE OF DEPTH OF FOCUS (ΔZ ~ 0.05 mm) IN TERMS OF DESIGNED DIMENSION OF BASE MATERIAL
S305
VARYING Ir, MAKING FOCAL LENGTH SHORTER (LONGER) BY ABOUT 0.05 mm, AND CONTROLLING BEAM DEFLECTION VOLTAGE ON THE BASIS OF N(Ir) OBTAINED BEFOREHAND, TO PRACTICE PATTERN DRAWING FOR RANGE WITHIN DEPTH OF FOCUS AT THIS FOCUS POSITION
S306
REPEATING ABOVE-MENTIONED S305 AND S306 UNTIL PATTERN DRAWING FOR ALL POSITIONS IN PERTINENT FIELD
S307
FTER RETURNING ELECTRON LENS CURRENT TO Ir1 AND MAKING XYZ STAGE DESCEND WITH MARGIN, MOVING XYZ STAGE TO LOWER (HIGHER) PORTION IN TERMS OF DESIGNED DIMENSION IN FIELD FOR WHICH PATTERN DRAWING IS TO BE DONE NEXT, SO AS TO MAKE IT AGREE WITH MEASURING POSITION (X,Y) OF SHS BEAM
S308
REPEATING S305 TO S308 UNTIL PATTERN DRAWING FOR ALL REGIONS IS FINISHED
S309
END

FIG. 11



MEASURING PREVIOUSLY REFERENCE POINTS OF BASE MATERIAL P00(x0,y0,z0), P01(x1,y1,z1), AND P02(x2,y2,z2), AND POSITION OF BASE MATERIAL TO BE IRRADIATED Q0 (X,Y,Z) AT APPROPRIATE INTERVALS (FOR EXAMPLE, 10μ*10μ) BY THREE-DIMENSIONAL MEASURING INSTRUMENT — S401

SETTING BASE MATERIAL IN PATTERN DRAWING APPARATUS, AND MEASURING REFERENCE POINTS OF BASE MATERIAL FROM POSITION TO MAKE ELECTRON BEAM IMAGE OF PATTERN DRAWING APPARATUS COME TO CENTER OF SCREEN, AND POSITIONS TO MAKE OUTPUT OF HEIGHT SENSOR 0, P10(X0,Y0,Z0), P11(X1,Y1,Z1), AND P12(X2,Y2,Z2), FROM VALUES OF XYZ STAGE OF PATTERN DRAWING APPARATUS — S402

OBTAINING TRANSFORMATION MATRIX M BY USING P00 TO P02 AND P10 TO P12 — S403

OBTAINING POINT TO WHICH PATTERN DRAWING IS TO BE APPLIED Q1(X,Y,Z) FROM CORRESPONDING Q0(x,y,z) BY USING Q1 = M * Q0. AFTER THIS, CONTROL OF STAGE IS TO BE DONE BY VALUES (SET) OF Q1. HOWEVER, IF PERTINENT POSITION IS NOT TO BE FOUND IN SET OF Q1, EACH OF X, Y, AND Z IS OBTAINED BY STRAIGHT LINE APPROXIMATION FROM NEIGHBORING POINTS qx1, qx2, ---. — S404

MOVING STAGE TO LOWEST (HIGHEST) PORTION IN FIELD ON WHICH A PATTERN IS FIRST TO BE DRAWN. PRACTICING PATTERN DRAWING FOR Q1 VALUES ONLY IN RANGE WITHIN DEPTH OF FOCUS (ABOUT 0.05 mm (*1)) — S405

PRACTICING PATTERN DRAWING FOR PORTION WITHIN DEPTH OF FOCUS TO WHICH PATTERN DRAWING HAS NOT BEEN APPLIED YET IN FIELD PERTINENT TO DESCENDING (ASCENDING) OF XYZ STAGE BY *1 — S406

AFTER REPEATING S405 AND S406 UNTIL PATTERN DRAWING FOR PERTINENT FIELD IS FINISHED, MOVING STAGE TO LOWER (HIGHER) PORTION OF NEXT FIELD — S407

REPEATING S405 TO S407 UNTIL WHOLE PATTERN DRAWING IS FINISHED — S408

FIG. 12

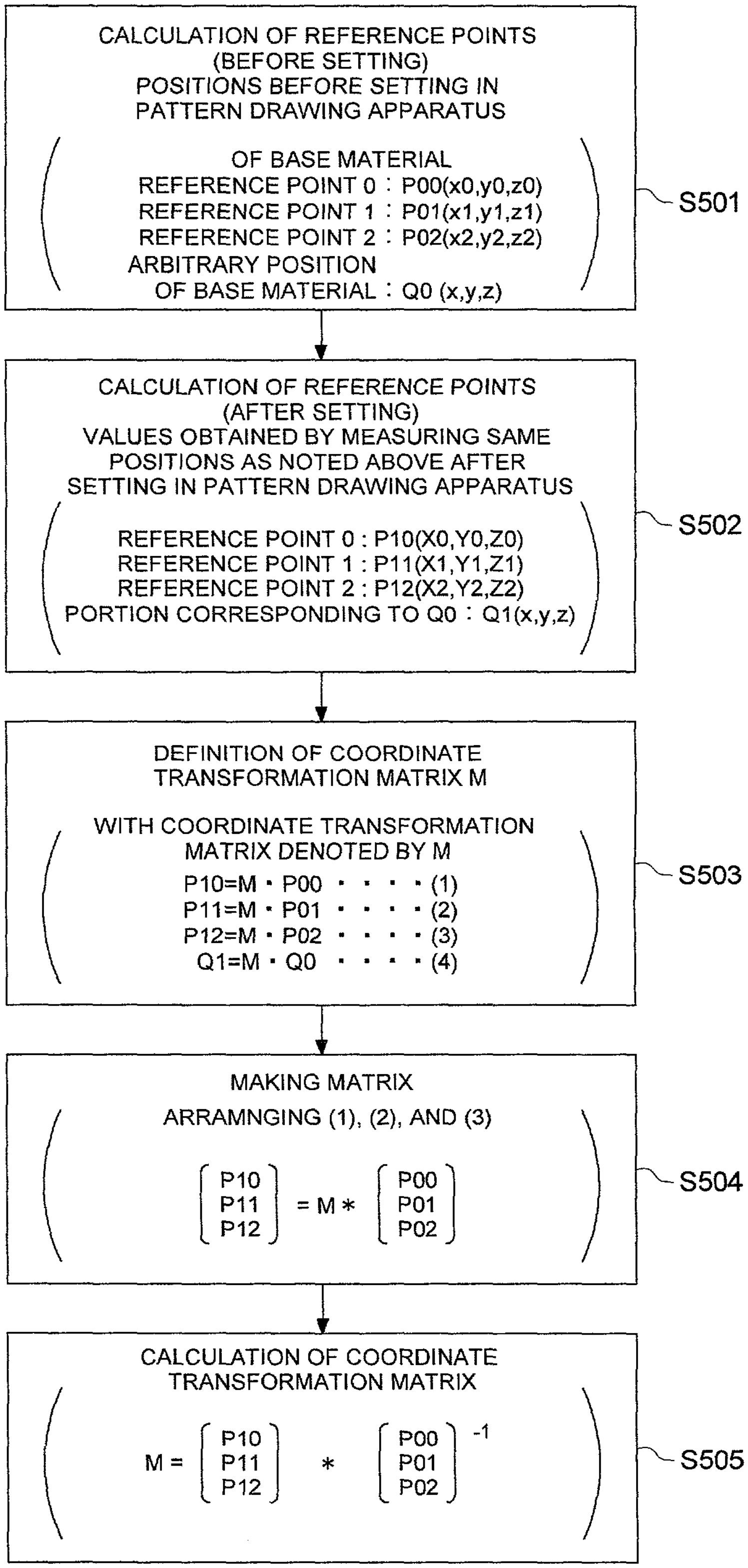

CALCULATION OF REFERENCE POINTS
(BEFORE SETTING)
POSITIONS BEFORE SETTING IN
PATTERN DRAWING APPARATUS
OF BASE MATERIAL
REFERENCE POINT 0 : P00(x0,y0,z0)
REFERENCE POINT 1 : P01(x1,y1,z1)
REFERENCE POINT 2 : P02(x2,y2,z2)
ARBITRARY POSITION
OF BASE MATERIAL : Q0 (x,y,z)
S501
CALCULATION OF REFERENCE POINTS
(AFTER SETTING)
VALUES OBTAINED BY MEASURING SAME
POSITIONS AS NOTED ABOVE AFTER
SETTING IN PATTERN DRAWING APPARATUS
REFERENCE POINT 0 : P10(X0,Y0,Z0)
REFERENCE POINT 1 : P11(X1,Y1,Z1)
REFERENCE POINT 2 : P12(X2,Y2,Z2)
PORTION CORRESPONDING TO Q0 : Q1(x,y,z)
S502
DEFINITION OF COORDINATE
TRANSFORMATION MATRIX M
WITH COORDINATE TRANSFORMATION
MATRIX DENOTED BY M
P10=M • P00 • • • • (1)
P11=M • P01 • • • • (2)
P12=M • P02 • • • • (3)
Q1=M • Q0 • • • • (4)
S503
MAKING MATRIX
ARRAMNGING (1), (2), AND (3)
$\begin{bmatrix} P10 \\ P11 \\ P12 \end{bmatrix} = M * \begin{bmatrix} P00 \\ P01 \\ P02 \end{bmatrix}$
S504
CALCULATION OF COORDINATE
TRANSFORMATION MATRIX
$M = \begin{bmatrix} P10 \\ P11 \\ P12 \end{bmatrix} * \begin{bmatrix} P00 \\ P01 \\ P02 \end{bmatrix}^{-1}$
S505

FIG. 13 (A)

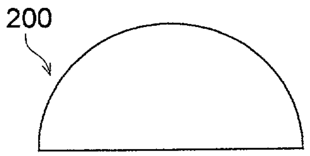


FIG. 13 (B)

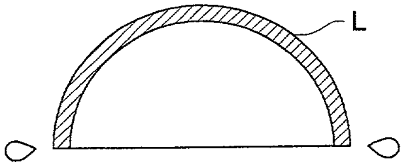


FIG. 13 (C)

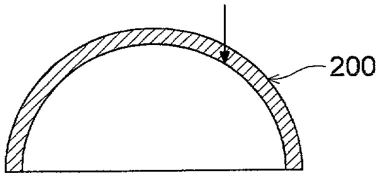


FIG. 13 (D)

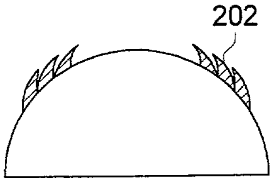


FIG. 13 (E)

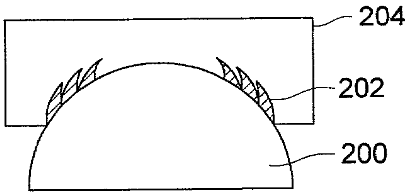


FIG. 13 (F)

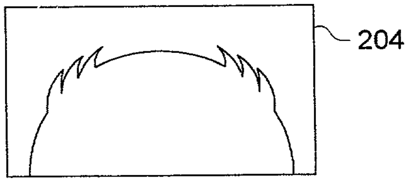


FIG. 14

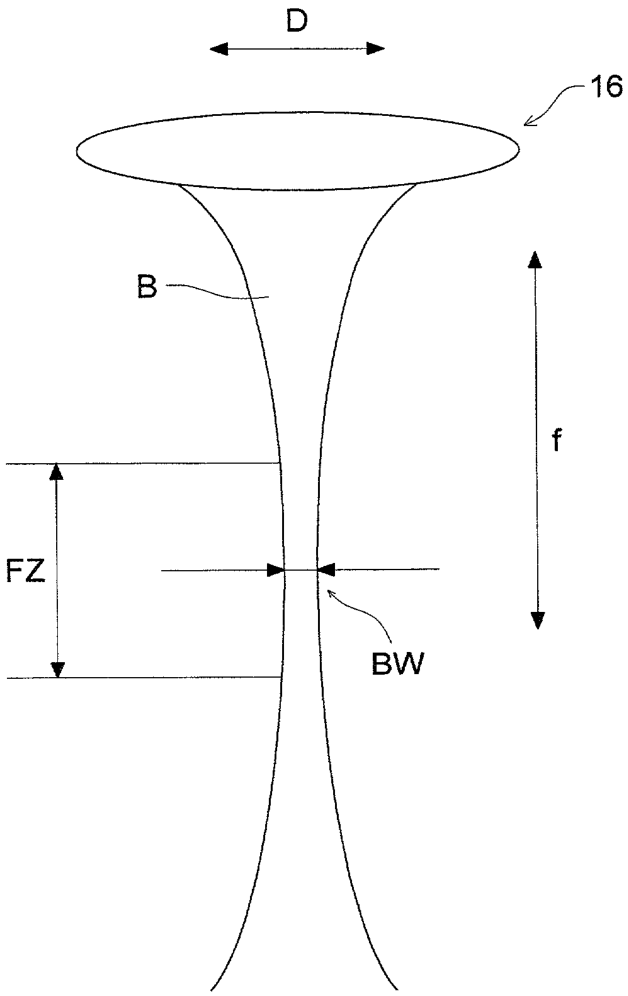


FIG. 15

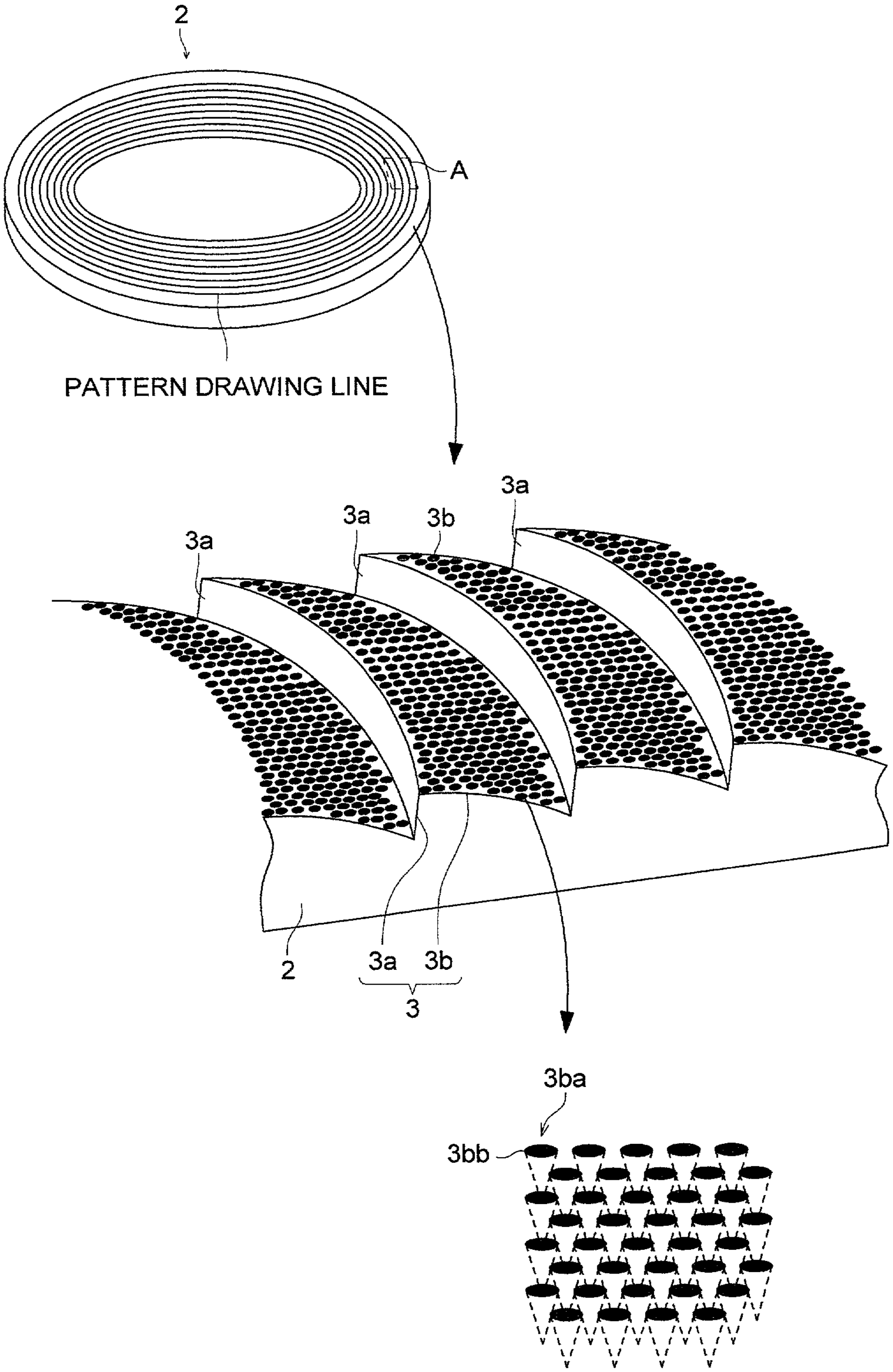


FIG. 16

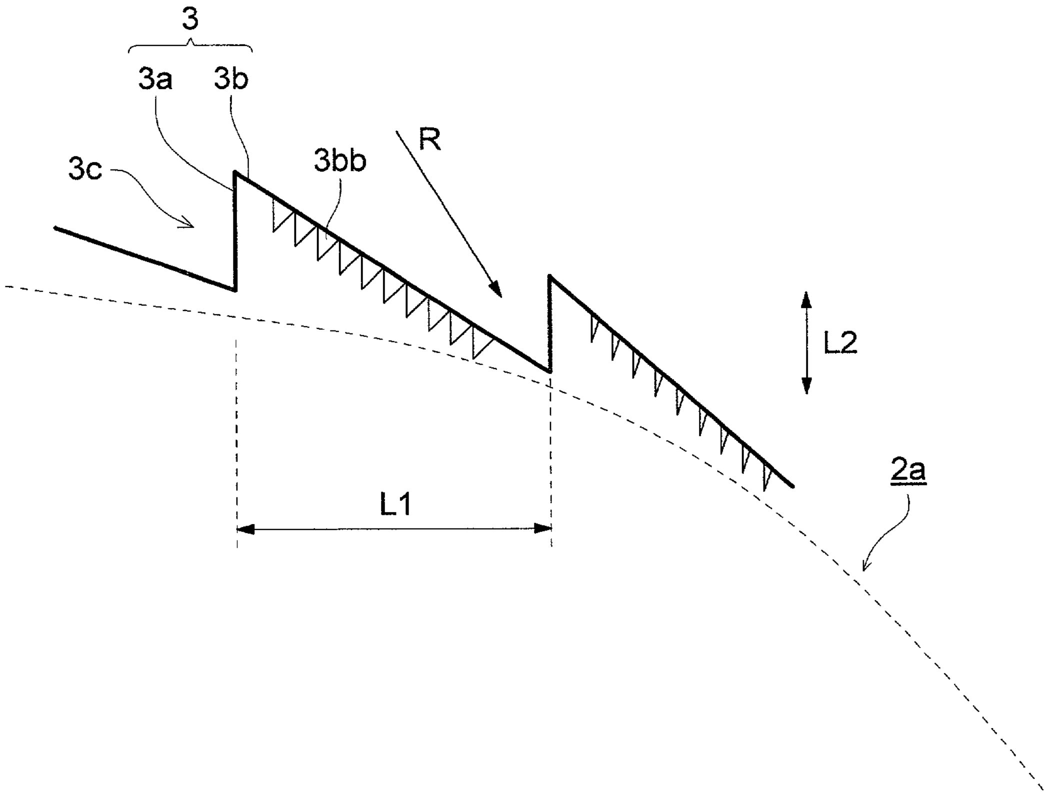


FIG. 17

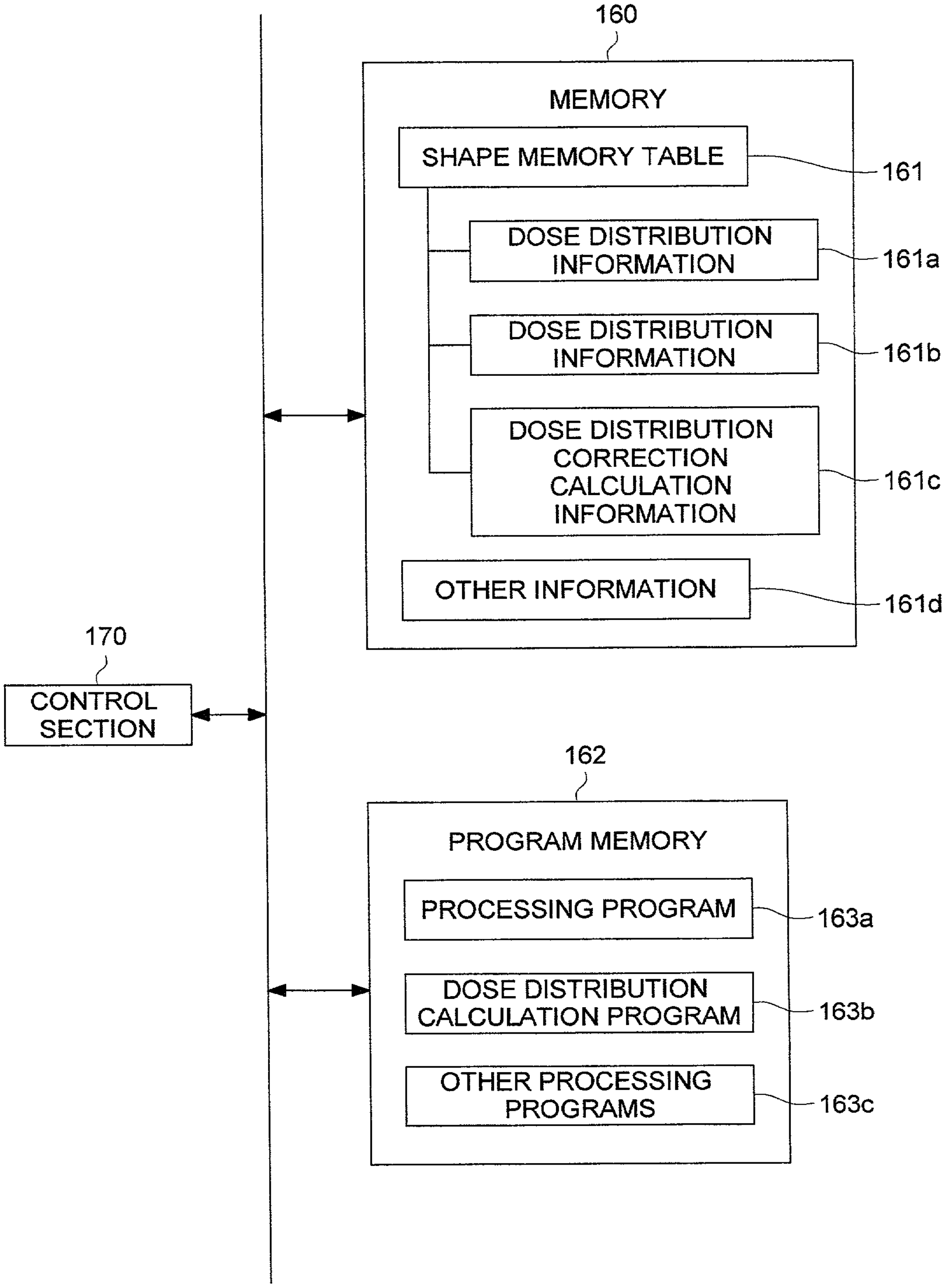

160
MEMORY
SHAPE MEMORY TABLE
161
DOSE DISTRIBUTION INFORMATION
161a
DOSE DISTRIBUTION INFORMATION
161b
DOSE DISTRIBUTION CORRECTION CALCULATION INFORMATION
161c
OTHER INFORMATION
161d
170
CONTROL SECTION
162
PROGRAM MEMORY
PROCESSING PROGRAM
163a
DOSE DISTRIBUTION CALCULATION PROGRAM
163b
OTHER PROCESSING PROGRAMS
163c

FIG. 18

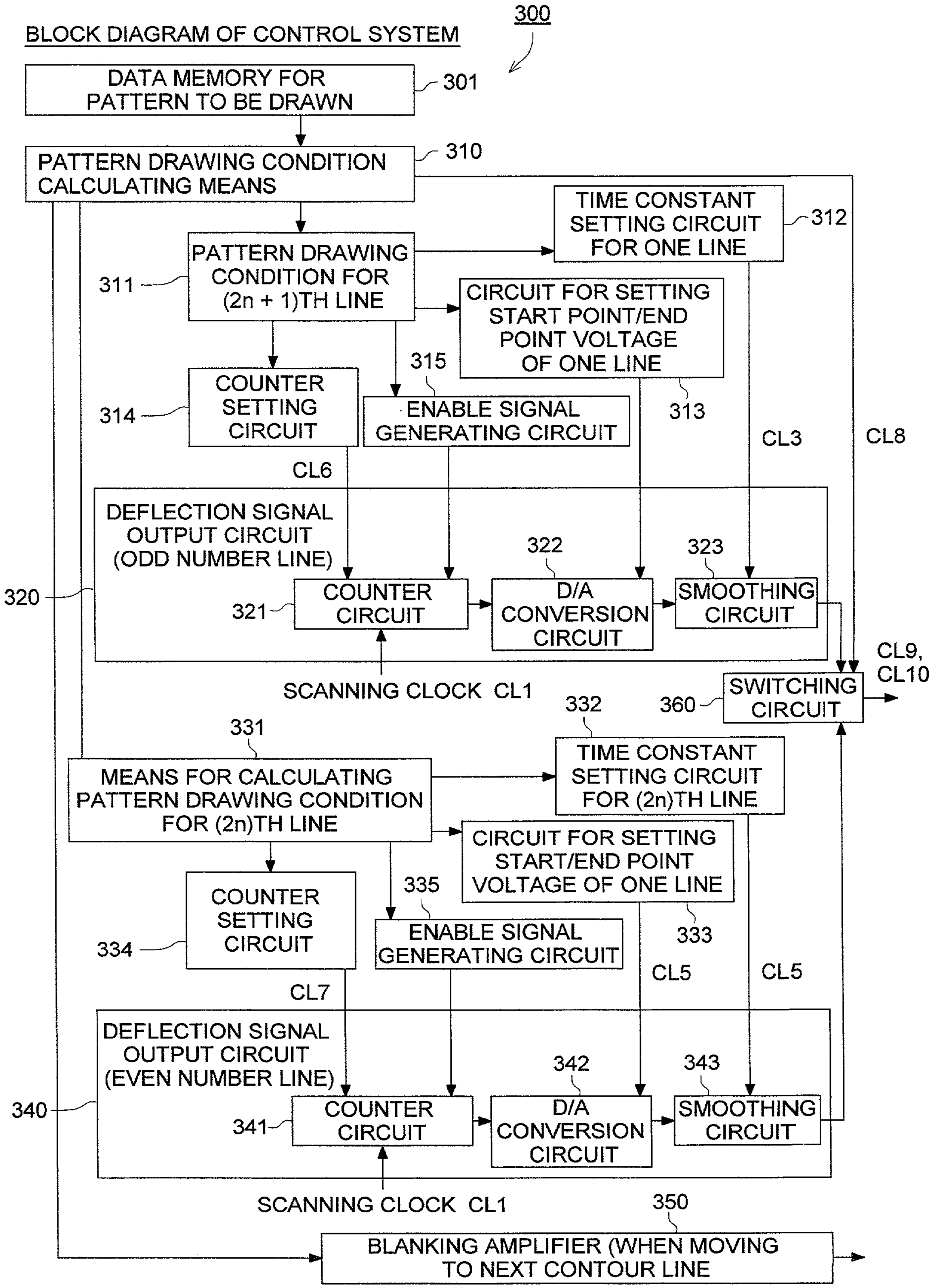

BLOCK DIAGRAM OF CONTROL SYSTEM
300
DATA MEMORY FOR PATTERN TO BE DRAWN
301
PATTERN DRAWING CONDITION CALCULATING MEANS
310
TIME CONSTANT SETTING CIRCUIT FOR ONE LINE
312
PATTERN DRAWING CONDITION FOR (2n + 1)TH LINE
311
CIRCUIT FOR SETTING START POINT/END POINT VOLTAGE OF ONE LINE
315
313
COUNTER SETTING CIRCUIT
314
ENABLE SIGNAL GENERATING CIRCUIT
CL3
CL8
CL6
DEFLECTION SIGNAL OUTPUT CIRCUIT (ODD NUMBER LINE)
322
323
320
COUNTER CIRCUIT
321
D/A CONVERSION CIRCUIT
SMOOTHING CIRCUIT
CL9, CL10
SCANNING CLOCK CL1
332
360
SWITCHING CIRCUIT
331
MEANS FOR CALCULATING PATTERN DRAWING CONDITION FOR (2n)TH LINE
TIME CONSTANT SETTING CIRCUIT FOR (2n)TH LINE
CIRCUIT FOR SETTING START/END POINT VOLTAGE OF ONE LINE
335
333
COUNTER SETTING CIRCUIT
334
ENABLE SIGNAL GENERATING CIRCUIT
CL5
CL5
CL7
DEFLECTION SIGNAL OUTPUT CIRCUIT (EVEN NUMBER LINE)
342
343
340
COUNTER CIRCUIT
341
D/A CONVERSION CIRCUIT
SMOOTHING CIRCUIT
SCANNING CLOCK CL1
350
BLANKING AMPLIFIER (WHEN MOVING TO NEXT CONTOUR LINE

FIG. 19

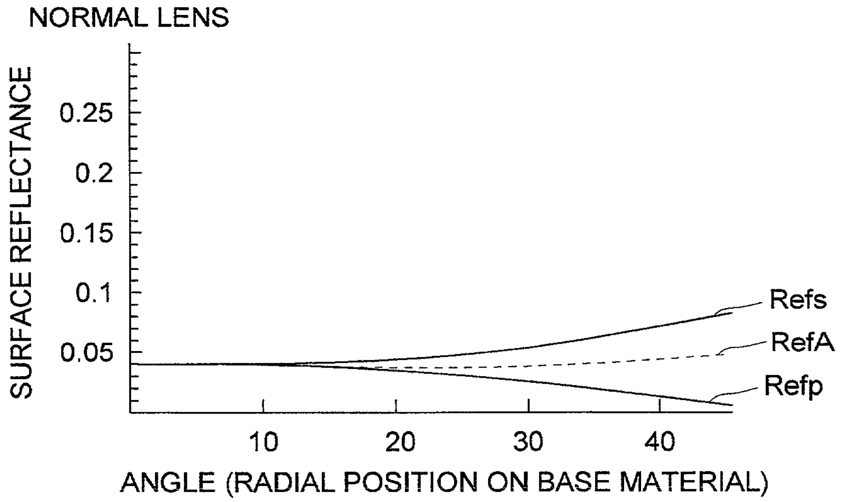

NORMAL LENS
SURFACE REFLECTANCE
0.25
0.2
0.15
0.1
0.05
10
20
30
40
ANGLE (RADIAL POSITION ON BASE MATERIAL)
Refs
RefA
Refp

FIG. 20

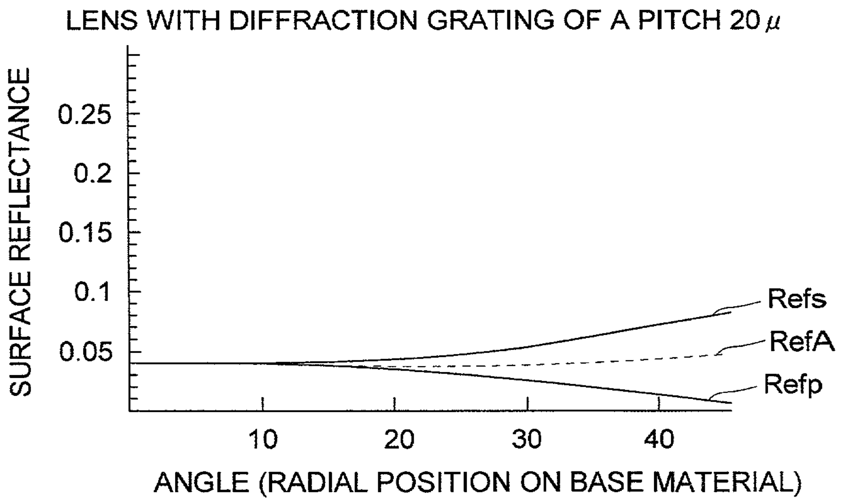

LENS WITH DIFFRACTION GRATING OF A PITCH 20μ
SURFACE REFLECTANCE
0.25
0.2
0.15
0.1
0.05
10
20
30
40
ANGLE (RADIAL POSITION ON BASE MATERIAL)
Refs
RefA
Refp

FIG. 21

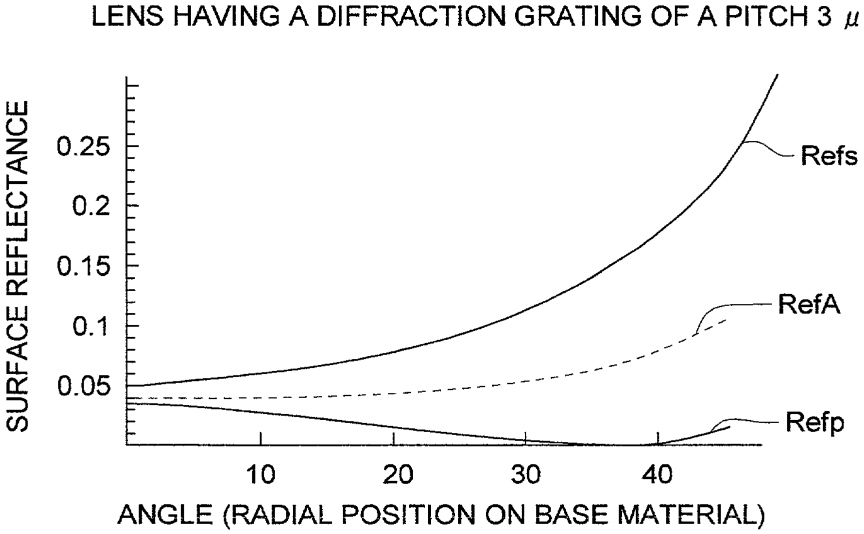

LENS HAVING A DIFFRACTION GRATING OF A PITCH 3 μ
SURFACE REFLECTANCE
0.25
0.2
0.15
0.1
0.05
Refs
RefA
Refp
10
20
30
40
ANGLE (RADIAL POSITION ON BASE MATERIAL)

FIG. 22

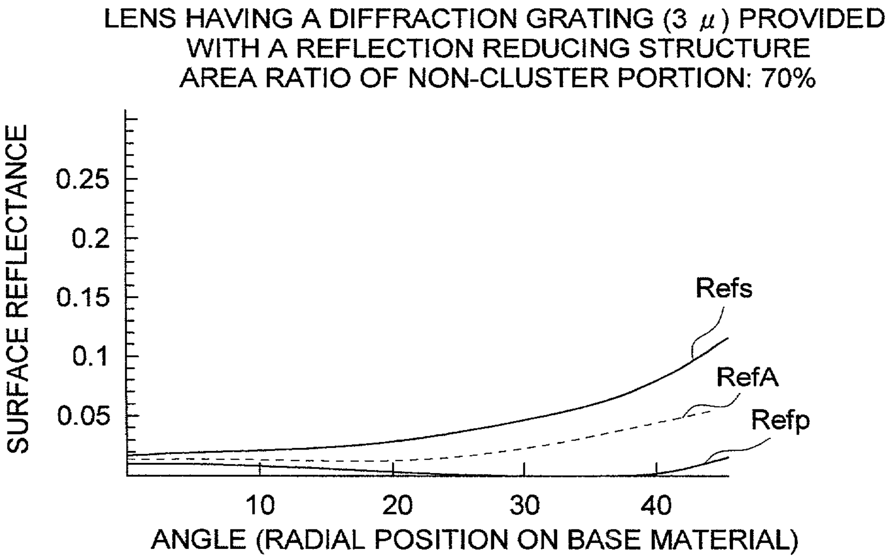
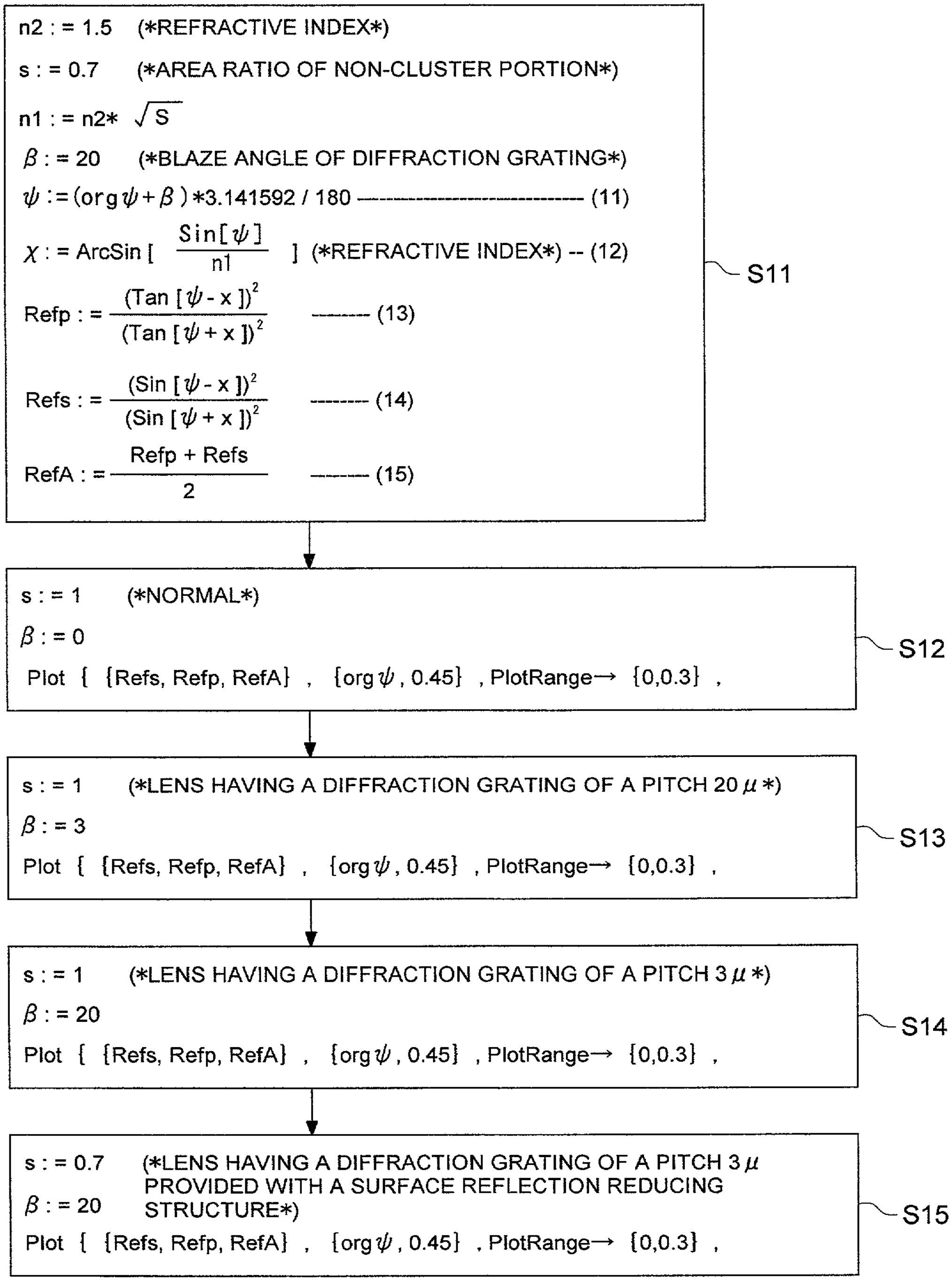

LENS HAVING A DIFFRACTION GRATING (3 μ) PROVIDED
WITH A REFLECTION REDUCING STRUCTURE
AREA RATIO OF NON-CLUSTER PORTION: 70%
SURFACE REFLECTANCE
0.25
0.2
0.15
0.1
0.05
Refs
RefA
Refp
10
20
30
40
ANGLE (RADIAL POSITION ON BASE MATERIAL)

FIG. 23



```
n2 : = 1.5    (*REFRACTIVE INDEX*)
s : = 0.7    (*AREA RATIO OF NON-CLUSTER PORTION*)
n1 : = n2*  $\sqrt{S}$
$\beta$ : = 20    (*BLAZE ANGLE OF DIFFRACTION GRATING*)
$\psi$ :=(org$\psi$+$\beta$)*3.141592 / 180 ---------------------------- (11)
$\chi$ : = ArcSin [ $\frac{\mathrm{Sin}[\psi]}{\mathrm{n1}}$ ] (*REFRACTIVE INDEX*) -- (12)
Refp : = $\frac{(\mathrm{Tan}\,[\psi - x\,])^2}{(\mathrm{Tan}\,[\psi + x\,])^2}$    -------- (13)
Refs : = $\frac{(\mathrm{Sin}\,[\psi - x\,])^2}{(\mathrm{Sin}\,[\psi + x\,])^2}$    -------- (14)
RefA : = $\frac{\mathrm{Refp + Refs}}{2}$    -------- (15)
```

```
s : = 1    (*NORMAL*)
$\beta$ : = 0
Plot [ {Refs, Refp, RefA} , {org$\psi$, 0.45} , PlotRange→ {0,0.3} ,
```

```
s : = 1    (*LENS HAVING A DIFFRACTION GRATING OF A PITCH 20$\mu$*)
$\beta$ : = 3
Plot [ {Refs, Refp, RefA} , {org$\psi$, 0.45} , PlotRange→ {0,0.3} ,
```

```
s : = 1    (*LENS HAVING A DIFFRACTION GRATING OF A PITCH 3$\mu$*)
$\beta$ : = 20
Plot [ {Refs, Refp, RefA} , {org$\psi$, 0.45} , PlotRange→ {0,0.3} ,
```

```
s : = 0.7    (*LENS HAVING A DIFFRACTION GRATING OF A PITCH 3$\mu$
$\beta$ : = 20    PROVIDED WITH A SURFACE REFLECTION REDUCING
              STRUCTURE*)
Plot [ {Refs, Refp, RefA} , {org$\psi$, 0.45} , PlotRange→ {0,0.3} ,
```

FIG. 24

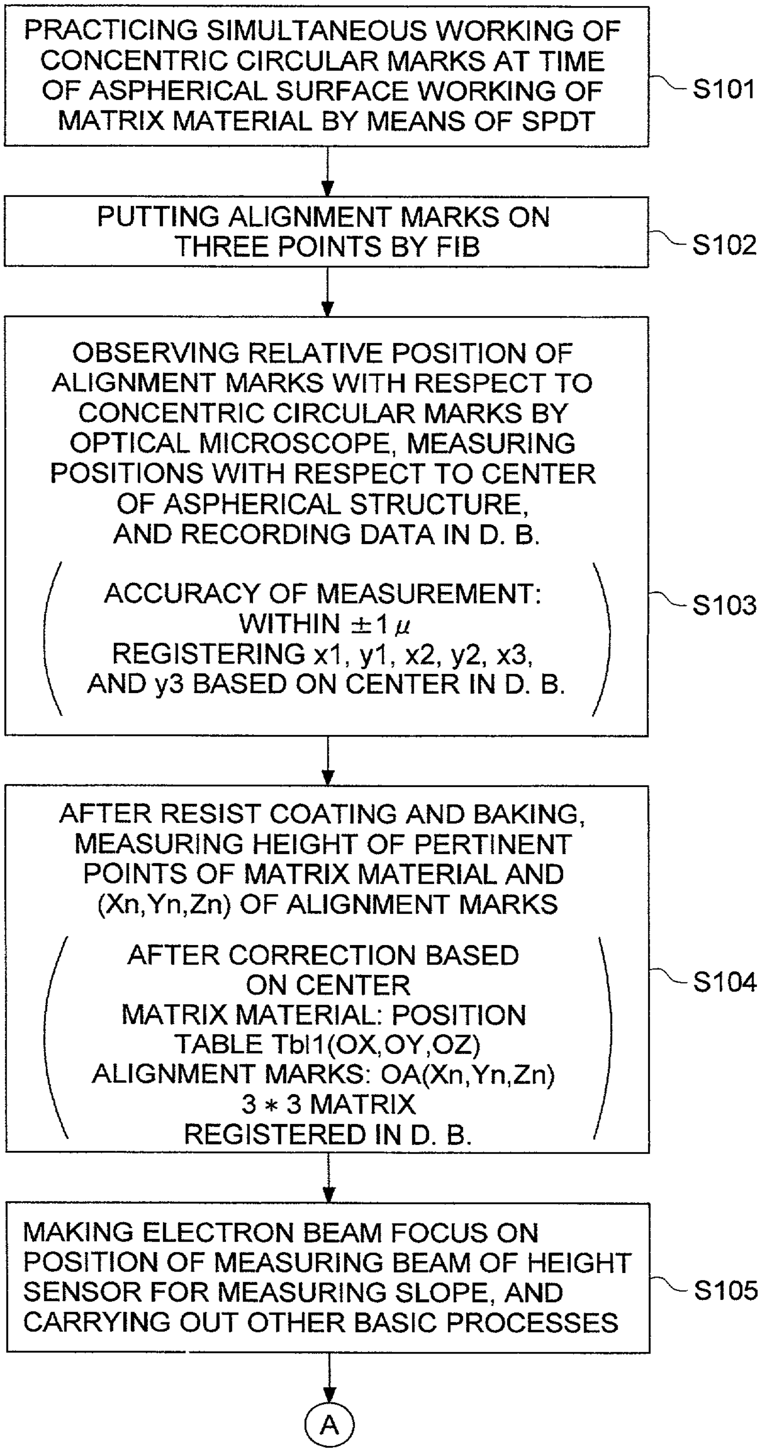

PRACTICING SIMULTANEOUS WORKING OF CONCENTRIC CIRCULAR MARKS AT TIME OF ASPHERICAL SURFACE WORKING OF MATRIX MATERIAL BY MEANS OF SPDT
S101
PUTTING ALIGNMENT MARKS ON THREE POINTS BY FIB
S102
OBSERVING RELATIVE POSITION OF ALIGNMENT MARKS WITH RESPECT TO CONCENTRIC CIRCULAR MARKS BY OPTICAL MICROSCOPE, MEASURING POSITIONS WITH RESPECT TO CENTER OF ASPHERICAL STRUCTURE, AND RECORDING DATA IN D. B.
(ACCURACY OF MEASUREMENT: WITHIN ±1μ REGISTERING x1, y1, x2, y2, x3, AND y3 BASED ON CENTER IN D. B.)
S103
AFTER RESIST COATING AND BAKING, MEASURING HEIGHT OF PERTINENT POINTS OF MATRIX MATERIAL AND (Xn,Yn,Zn) OF ALIGNMENT MARKS
(AFTER CORRECTION BASED ON CENTER MATRIX MATERIAL: POSITION TABLE Tbl1(OX,OY,OZ) ALIGNMENT MARKS: OA(Xn,Yn,Zn) 3 * 3 MATRIX REGISTERED IN D. B.)
S104
MAKING ELECTRON BEAM FOCUS ON POSITION OF MEASURING BEAM OF HEIGHT SENSOR FOR MEASURING SLOPE, AND CARRYING OUT OTHER BASIC PROCESSES
S105
A

FIG. 25

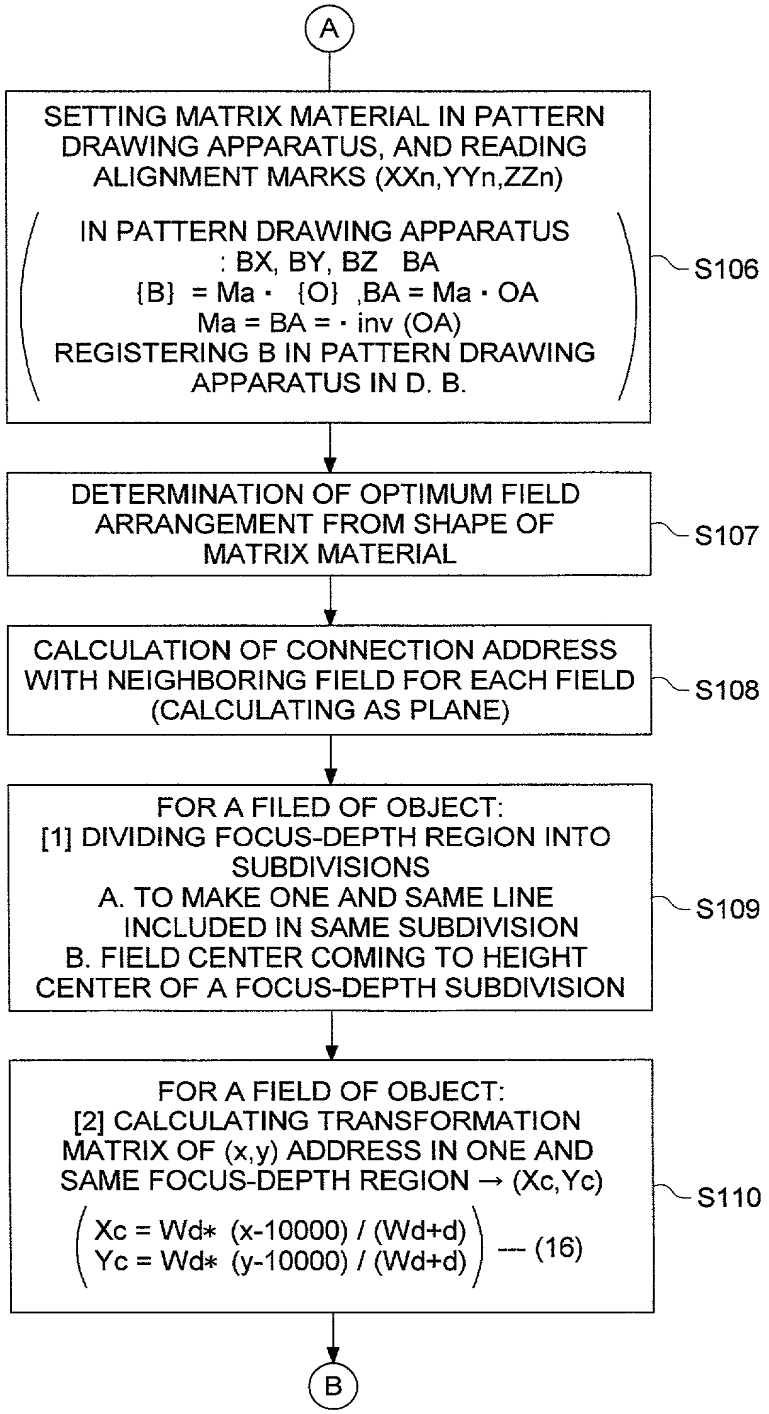

A
SETTING MATRIX MATERIAL IN PATTERN DRAWING APPARATUS, AND READING ALIGNMENT MARKS (XXn,YYn,ZZn)
IN PATTERN DRAWING APPARATUS
: BX, BY, BZ BA
{B} = Ma · {O} ,BA = Ma · OA
Ma = BA = · inv (OA)
REGISTERING B IN PATTERN DRAWING APPARATUS IN D. B.
S106
DETERMINATION OF OPTIMUM FIELD ARRANGEMENT FROM SHAPE OF MATRIX MATERIAL
S107
CALCULATION OF CONNECTION ADDRESS WITH NEIGHBORING FIELD FOR EACH FIELD (CALCULATING AS PLANE)
S108
FOR A FILED OF OBJECT:
[1] DIVIDING FOCUS-DEPTH REGION INTO SUBDIVISIONS
A. TO MAKE ONE AND SAME LINE INCLUDED IN SAME SUBDIVISION
B. FIELD CENTER COMING TO HEIGHT CENTER OF A FOCUS-DEPTH SUBDIVISION
S109
FOR A FIELD OF OBJECT:
[2] CALCULATING TRANSFORMATION MATRIX OF (x,y) ADDRESS IN ONE AND SAME FOCUS-DEPTH REGION → (Xc,Yc)
Xc = Wd* (x-10000) / (Wd+d)
Yc = Wd* (y-10000) / (Wd+d)
--- (16)
S110
B

FIG. 26

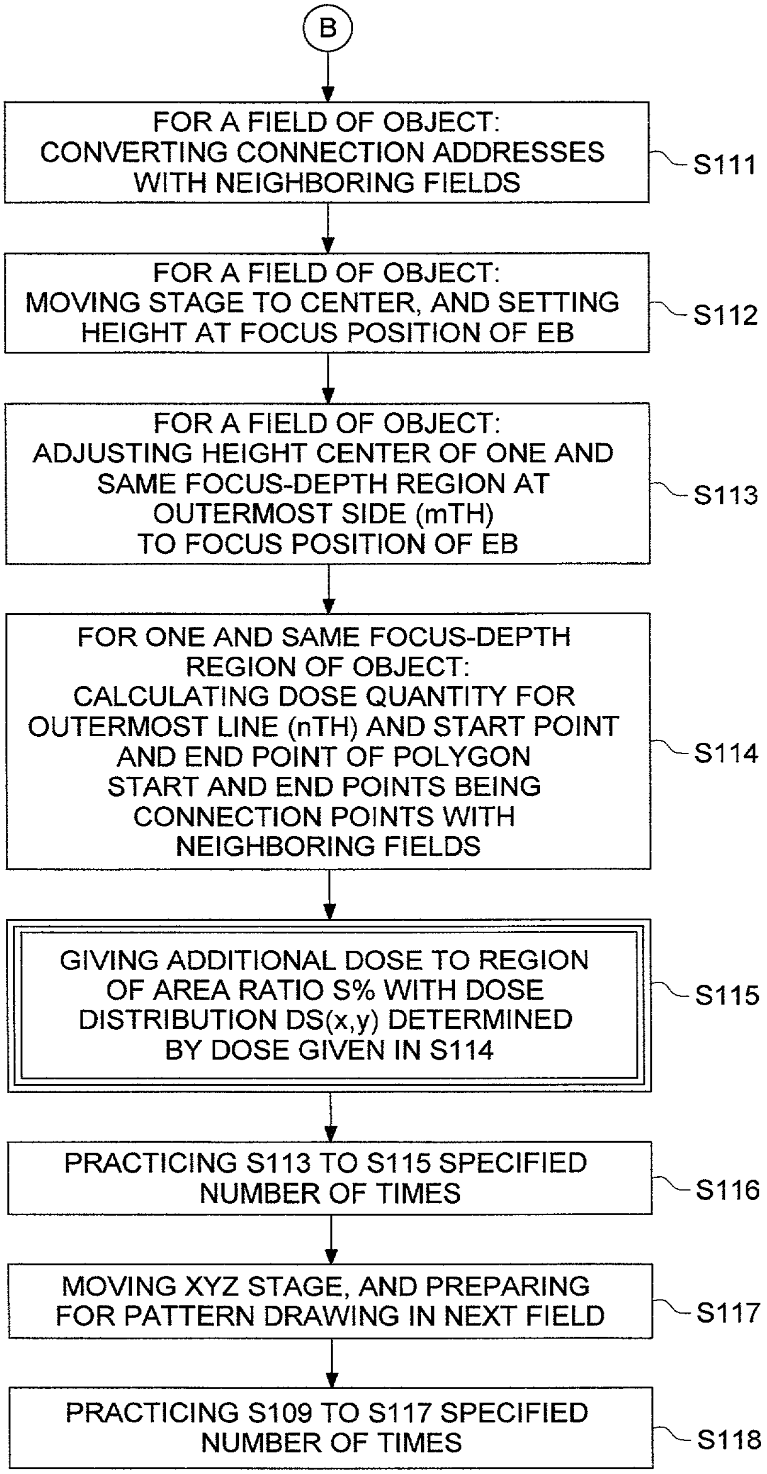

B
FOR A FIELD OF OBJECT: CONVERTING CONNECTION ADDRESSES WITH NEIGHBORING FIELDS
S111
FOR A FIELD OF OBJECT: MOVING STAGE TO CENTER, AND SETTING HEIGHT AT FOCUS POSITION OF EB
S112
FOR A FIELD OF OBJECT: ADJUSTING HEIGHT CENTER OF ONE AND SAME FOCUS-DEPTH REGION AT OUTERMOST SIDE (mTH) TO FOCUS POSITION OF EB
S113
FOR ONE AND SAME FOCUS-DEPTH REGION OF OBJECT: CALCULATING DOSE QUANTITY FOR OUTERMOST LINE (nTH) AND START POINT AND END POINT OF POLYGON START AND END POINTS BEING CONNECTION POINTS WITH NEIGHBORING FIELDS
S114
GIVING ADDITIONAL DOSE TO REGION OF AREA RATIO S% WITH DOSE DISTRIBUTION DS(x,y) DETERMINED BY DOSE GIVEN IN S114
S115
PRACTICING S113 TO S115 SPECIFIED NUMBER OF TIMES
S116
MOVING XYZ STAGE, AND PREPARING FOR PATTERN DRAWING IN NEXT FIELD
S117
PRACTICING S109 TO S117 SPECIFIED NUMBER OF TIMES
S118

FIG. 27 (A)

PATTERN TO BE DRAWN

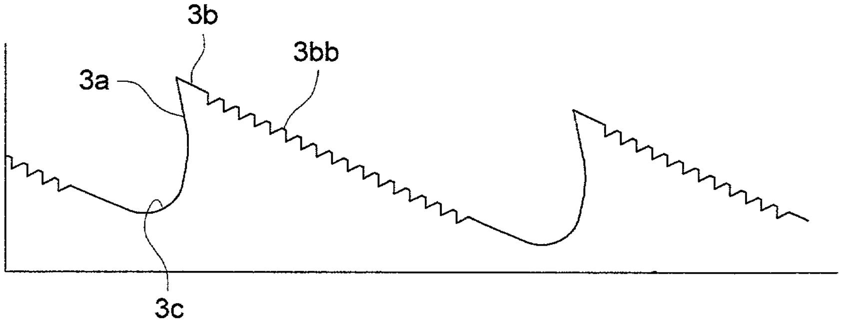


FIG. 27 (B)

DOSE DISTRIBUTION

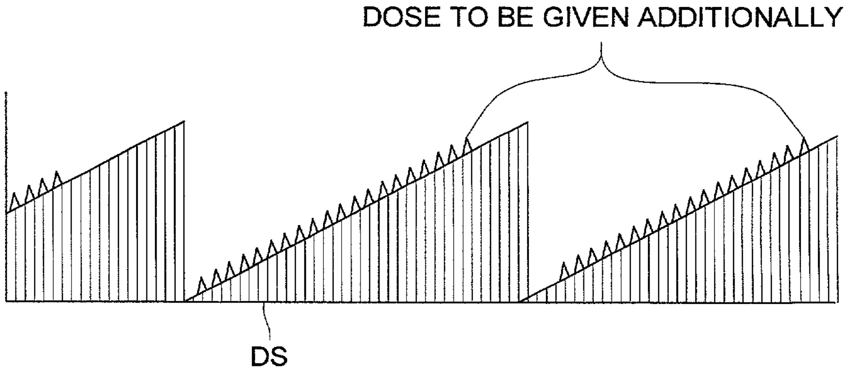


FIG. 28 (A)

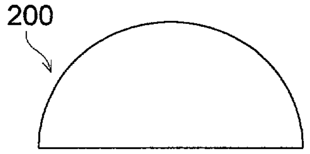


FIG. 28 (B)

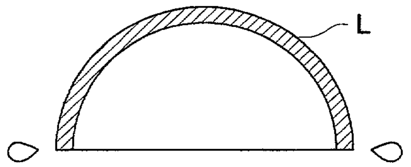


FIG. 28 (C)

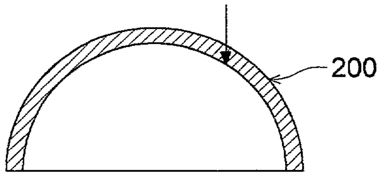


FIG. 28 (D)

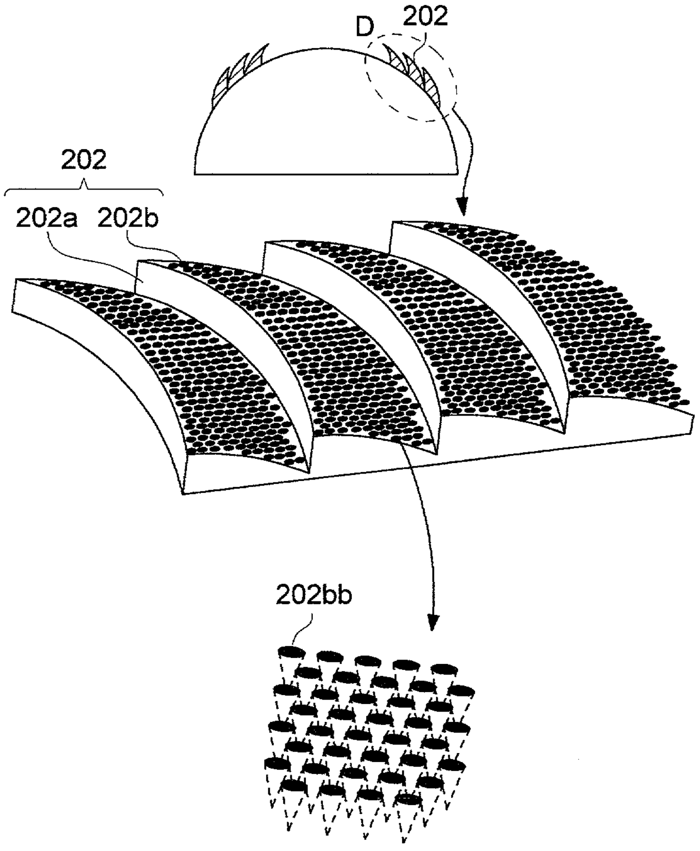


FIG. 29 (A)

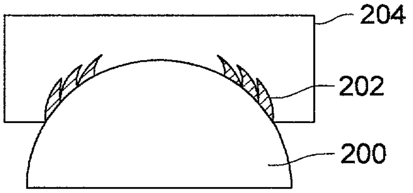


FIG. 29 (B)

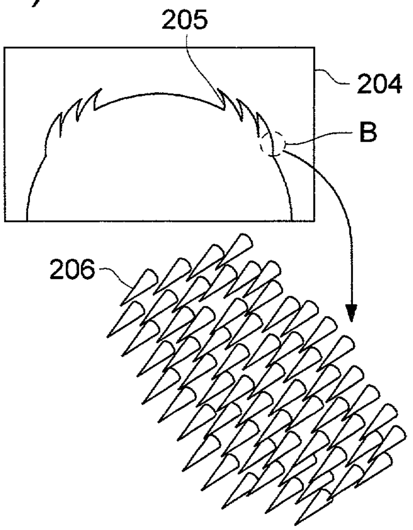


FIG. 29 (C)

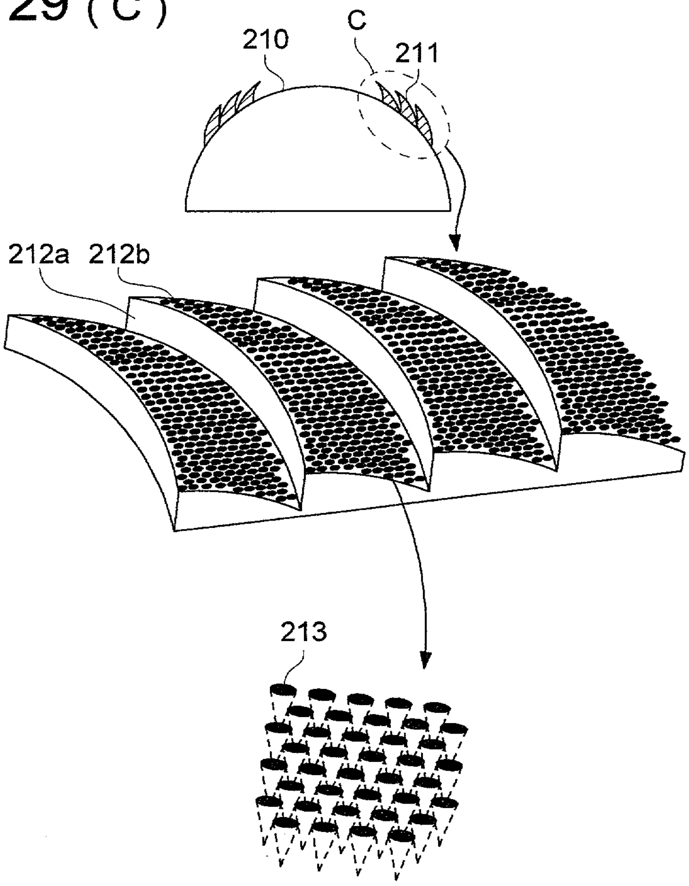


FIG. 30

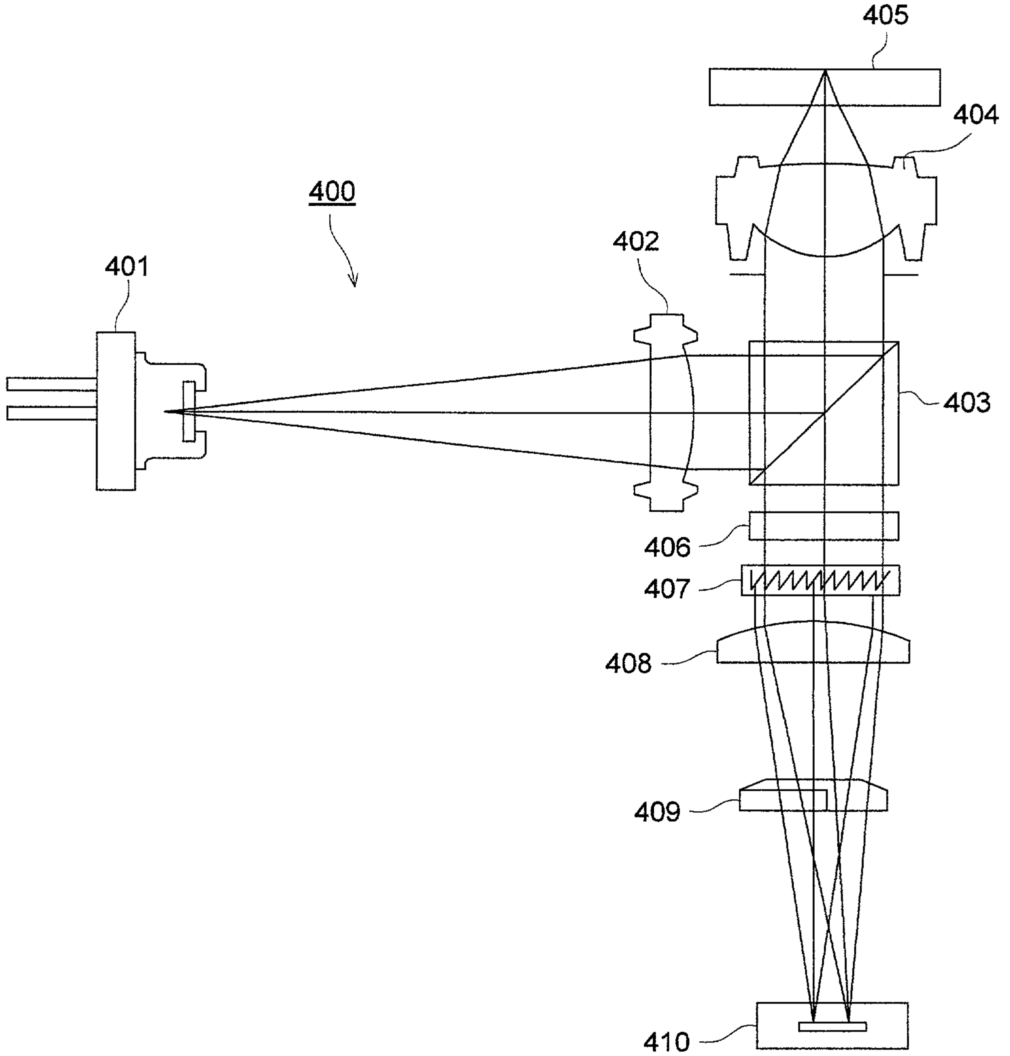


FIG. 31

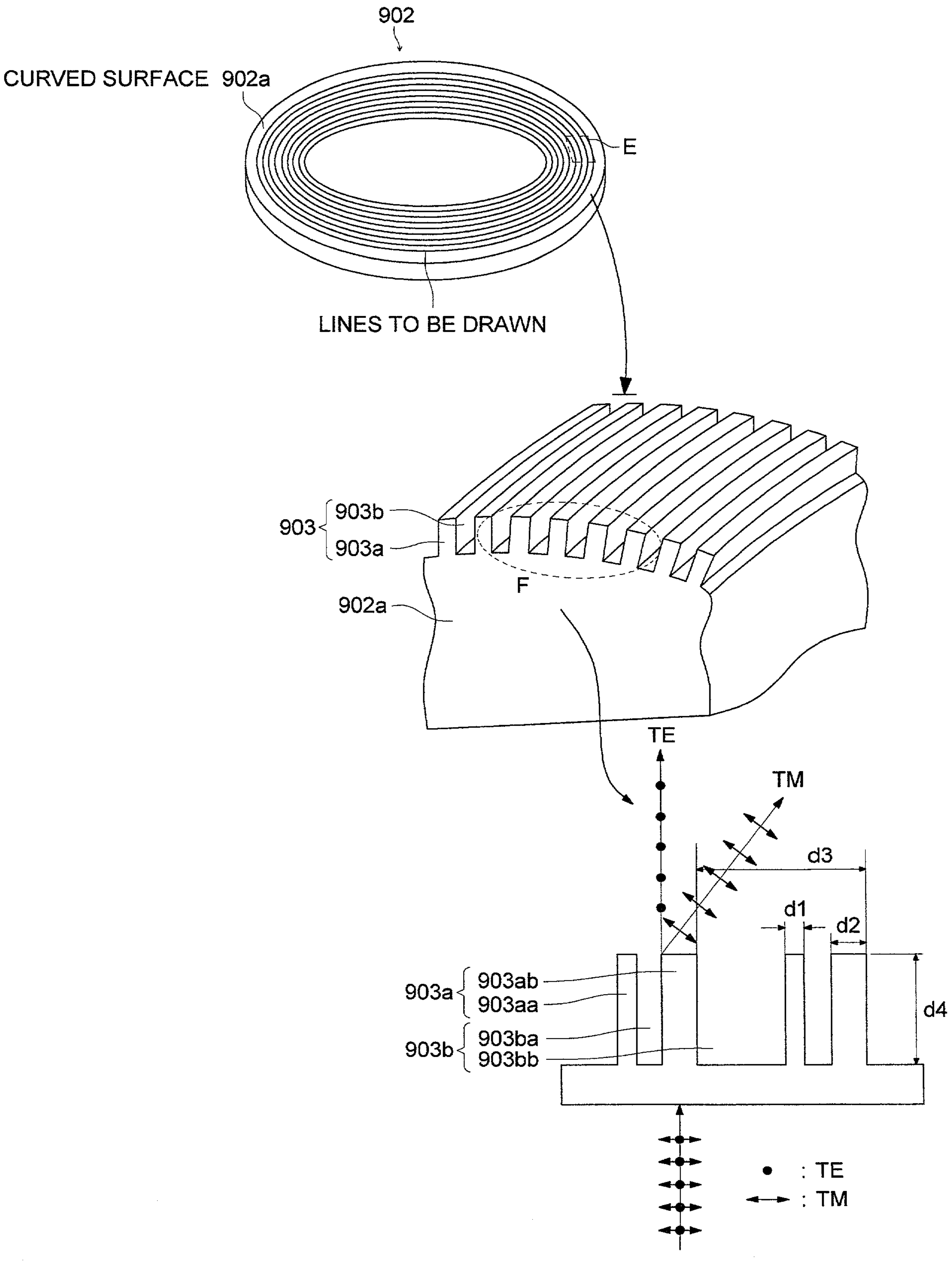

902
CURVED SURFACE 902a
E
LINES TO BE DRAWN
903
903b
903a
902a
F
TE
TM
d3
d1
d2
d4
903a
903ab
903aa
903b
903ba
903bb
● : TE
↔ : TM

FIG. 32

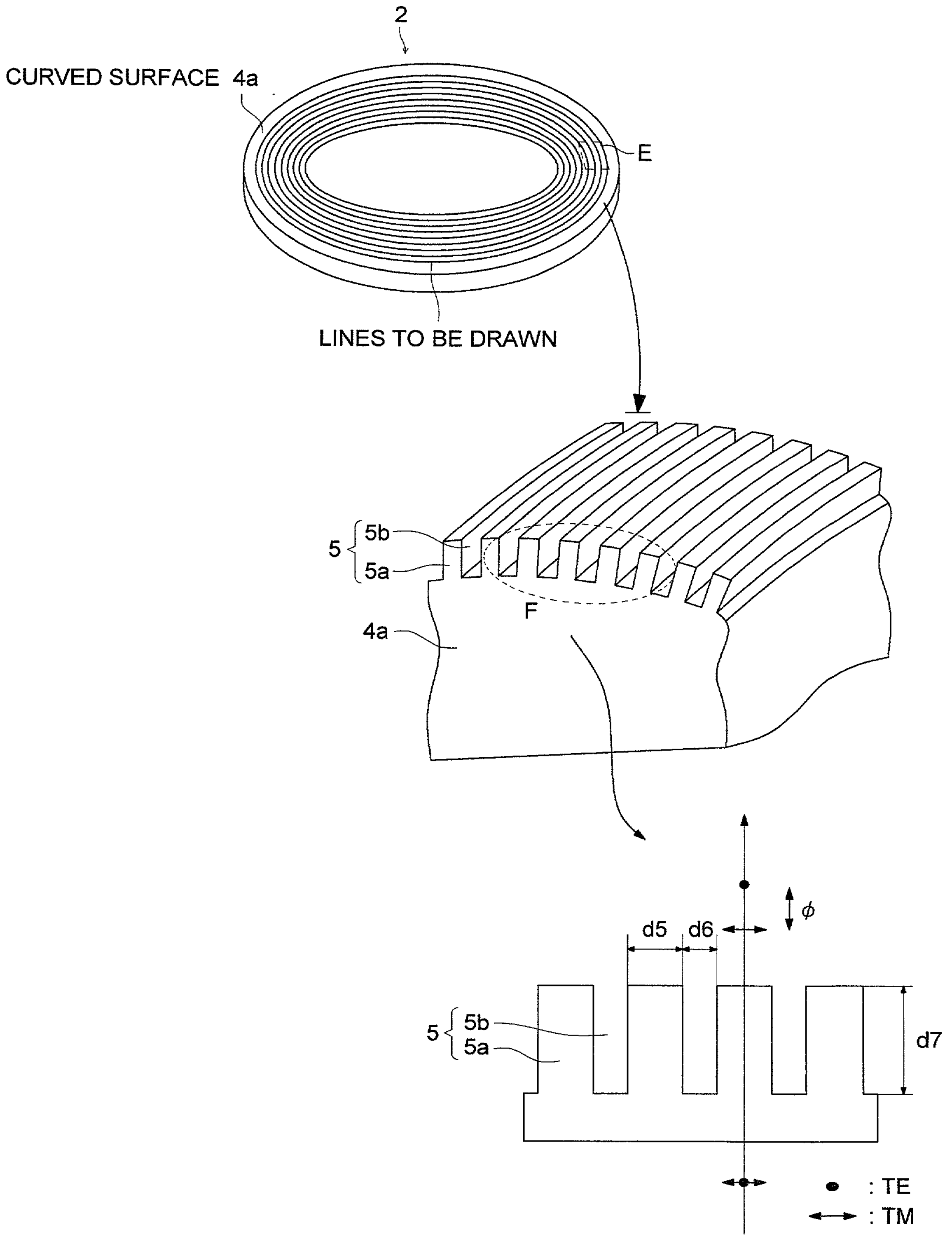

2
CURVED SURFACE 4a
E
LINES TO BE DRAWN
5
5b
5a
F
4a
ϕ
d5
d6
d7
5
5b
5a
● : TE
↔ : TM

FIG. 33

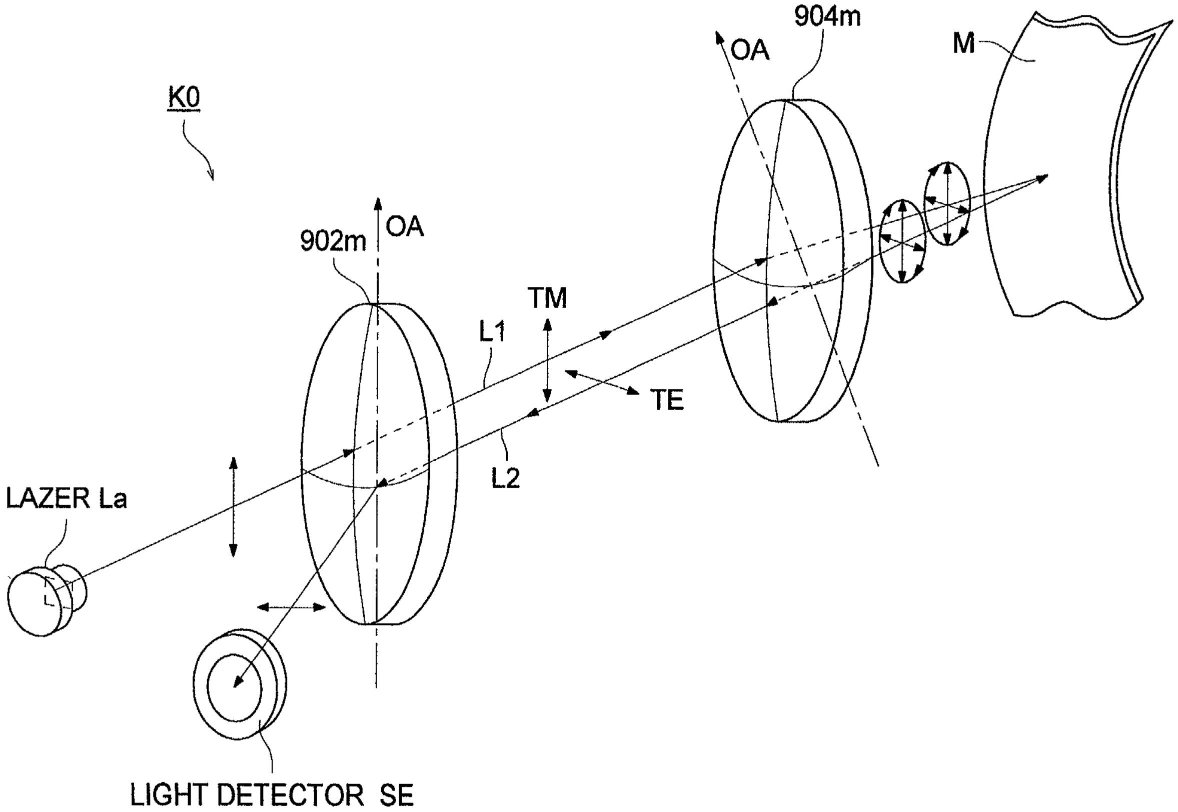


FIG. 34 (A)

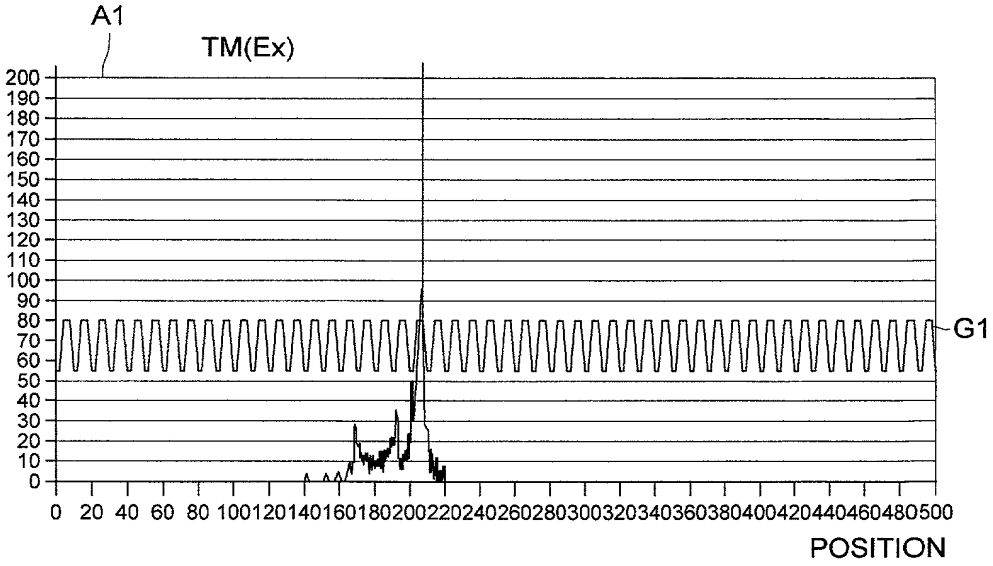


FIG. 34 (B)

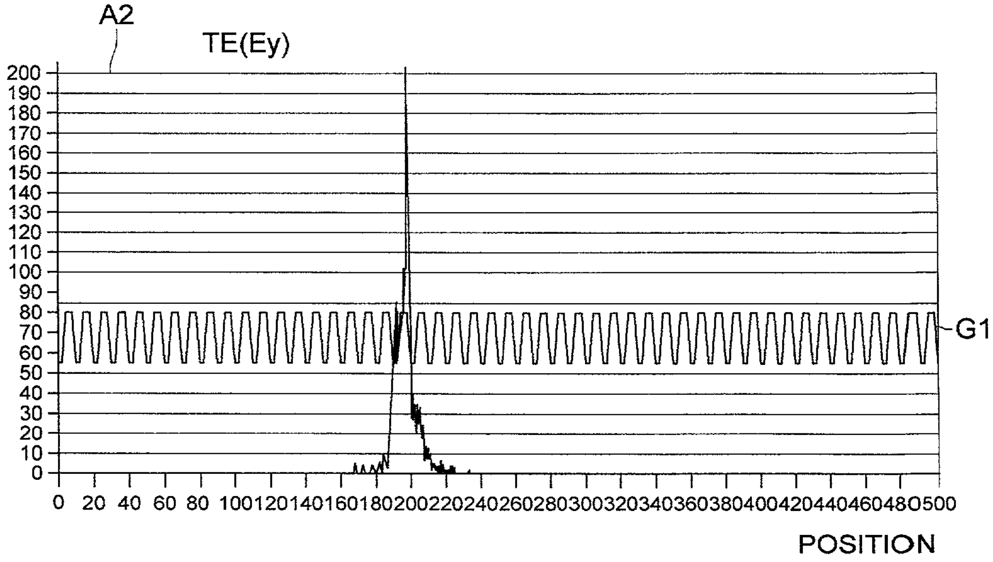


FIG. 35 (A)

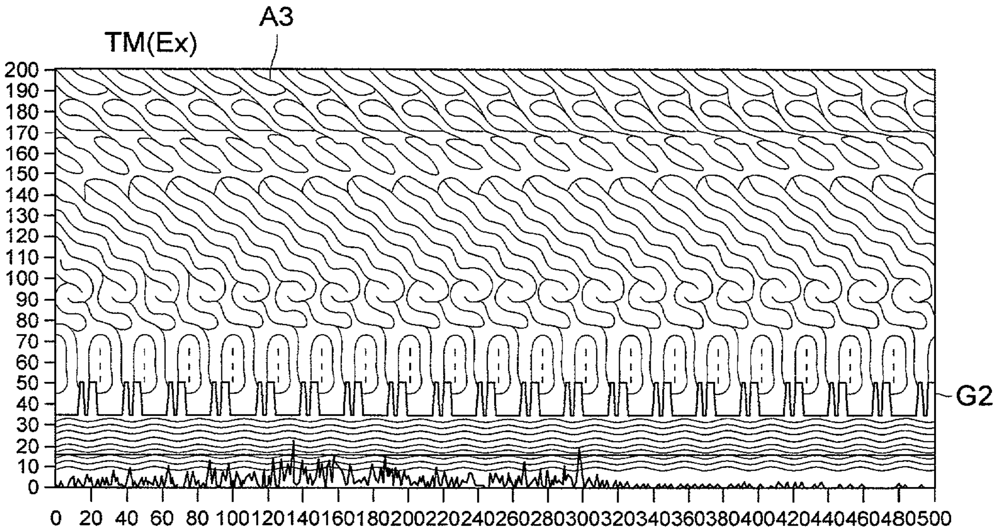


FIG. 35 (B)

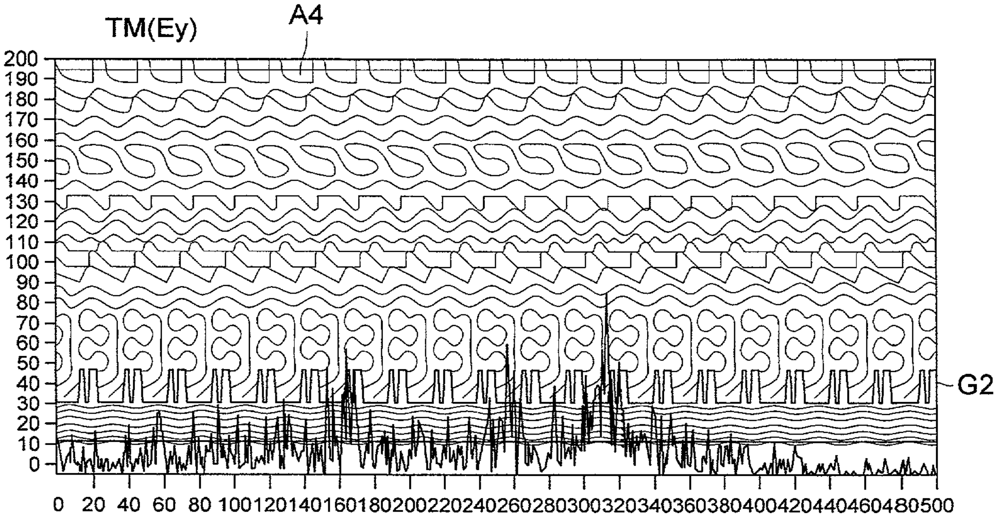


FIG. 36

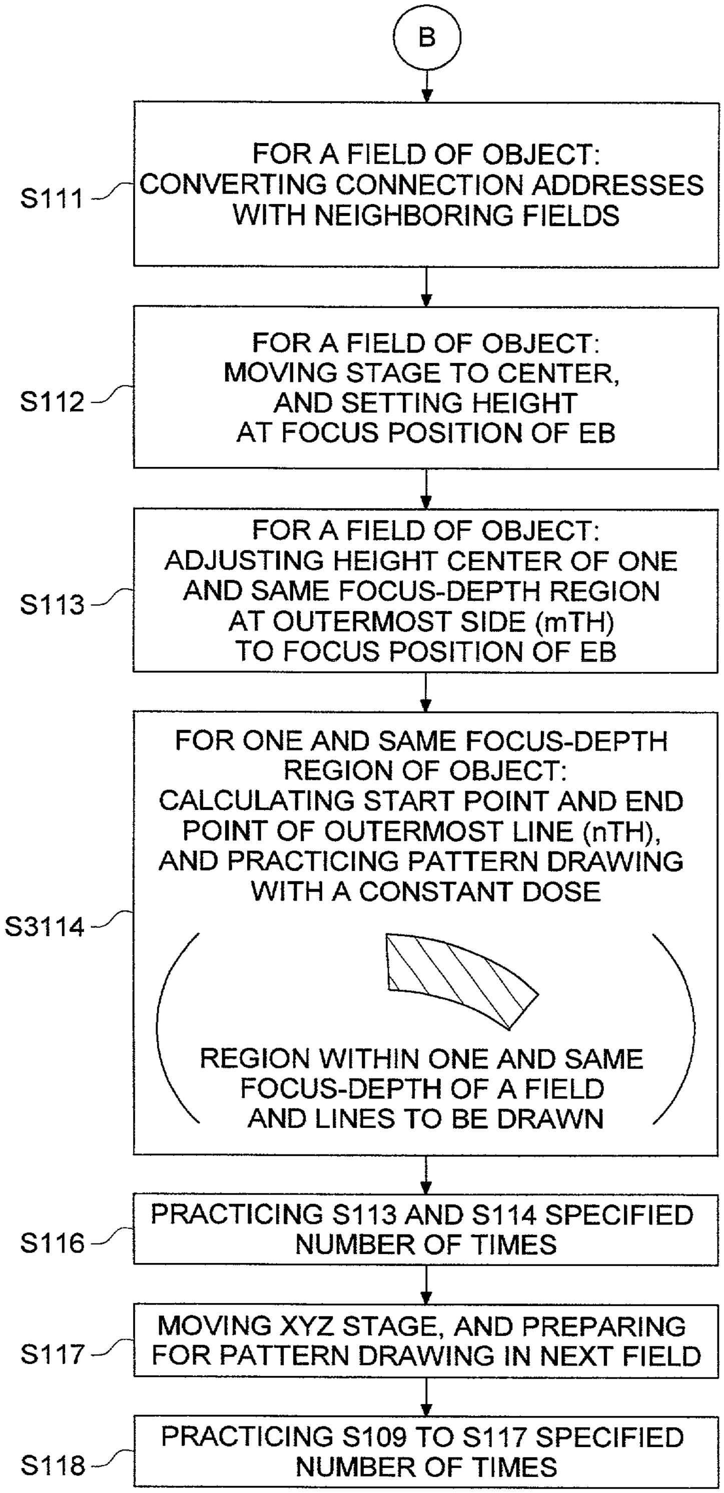

B
S111
FOR A FIELD OF OBJECT:
CONVERTING CONNECTION ADDRESSES
WITH NEIGHBORING FIELDS
S112
FOR A FIELD OF OBJECT:
MOVING STAGE TO CENTER,
AND SETTING HEIGHT
AT FOCUS POSITION OF EB
S113
FOR A FIELD OF OBJECT:
ADJUSTING HEIGHT CENTER OF ONE
AND SAME FOCUS-DEPTH REGION
AT OUTERMOST SIDE (mTH)
TO FOCUS POSITION OF EB
S3114
FOR ONE AND SAME FOCUS-DEPTH
REGION OF OBJECT:
CALCULATING START POINT AND END
POINT OF OUTERMOST LINE (nTH),
AND PRACTICING PATTERN DRAWING
WITH A CONSTANT DOSE
REGION WITHIN ONE AND SAME
FOCUS-DEPTH OF A FIELD
AND LINES TO BE DRAWN
S116
PRACTICING S113 AND S114 SPECIFIED
NUMBER OF TIMES
S117
MOVING XYZ STAGE, AND PREPARING
FOR PATTERN DRAWING IN NEXT FIELD
S118
PRACTICING S109 TO S117 SPECIFIED
NUMBER OF TIMES

FIG. 37 (A)

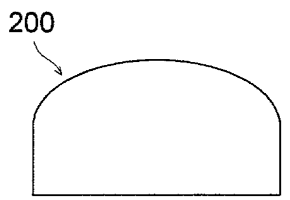


FIG. 37 (B)

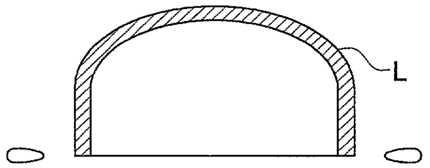


FIG. 37 (C)

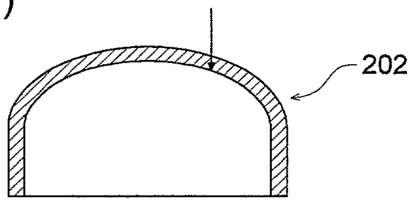


FIG. 37 (D)

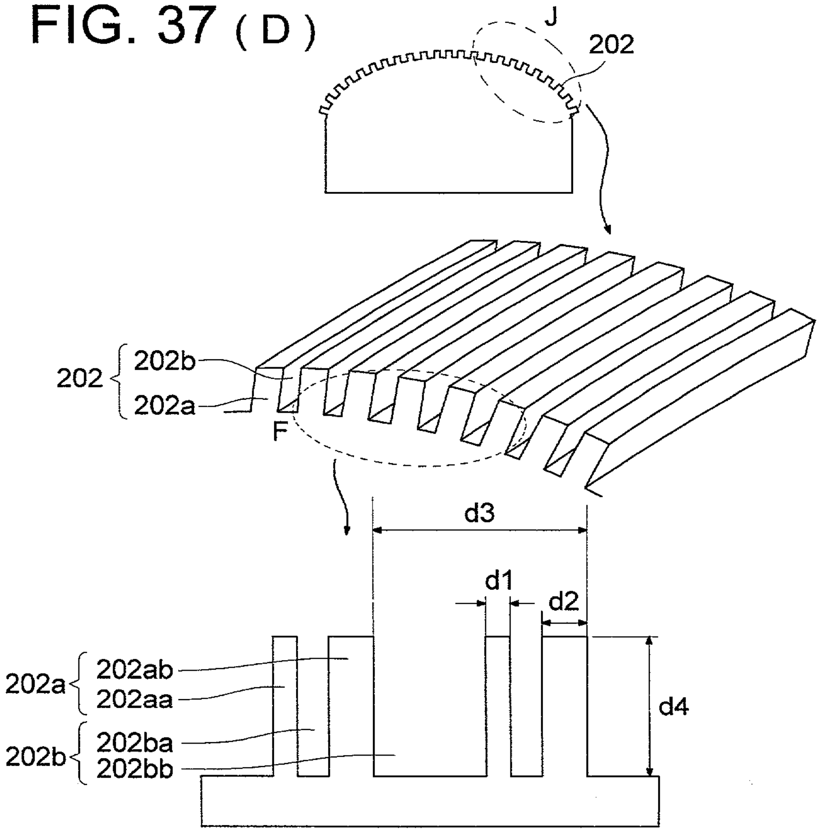


FIG. 38 (A)

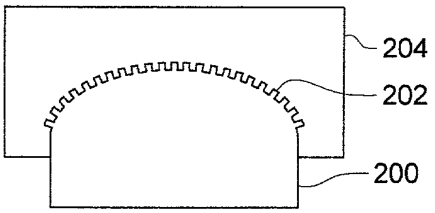


FIG. 38 (B)

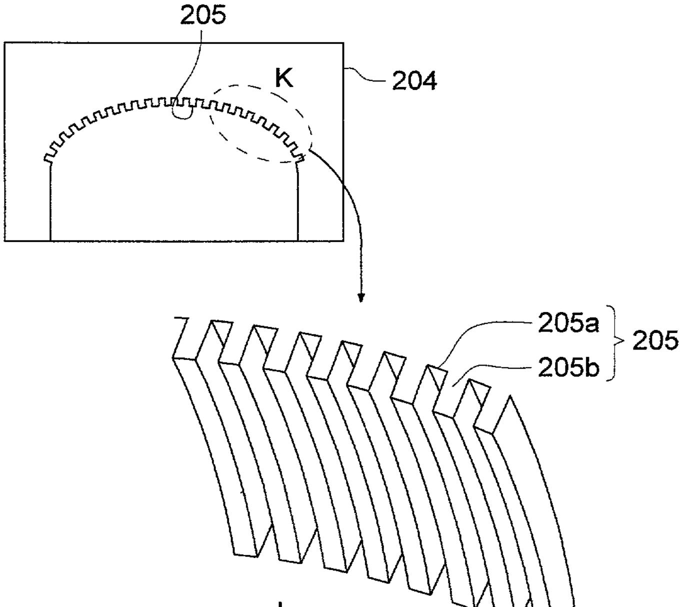


FIG. 38 (C)

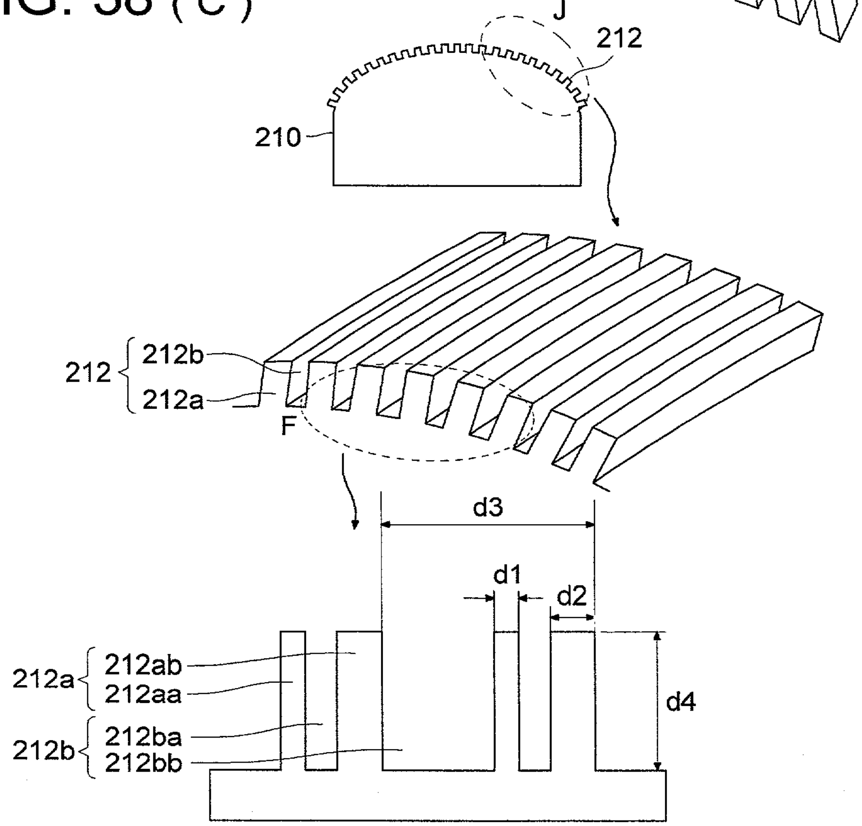


FIG. 39 (A)

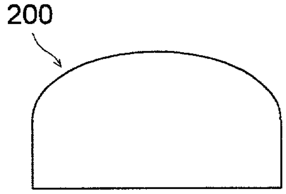


FIG. 39 (B)

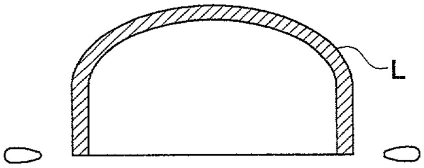


FIG. 39 (C)

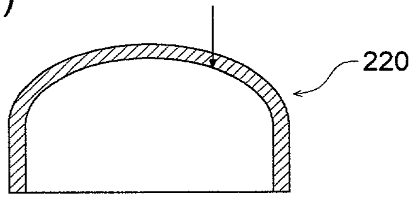


FIG. 39 (D)

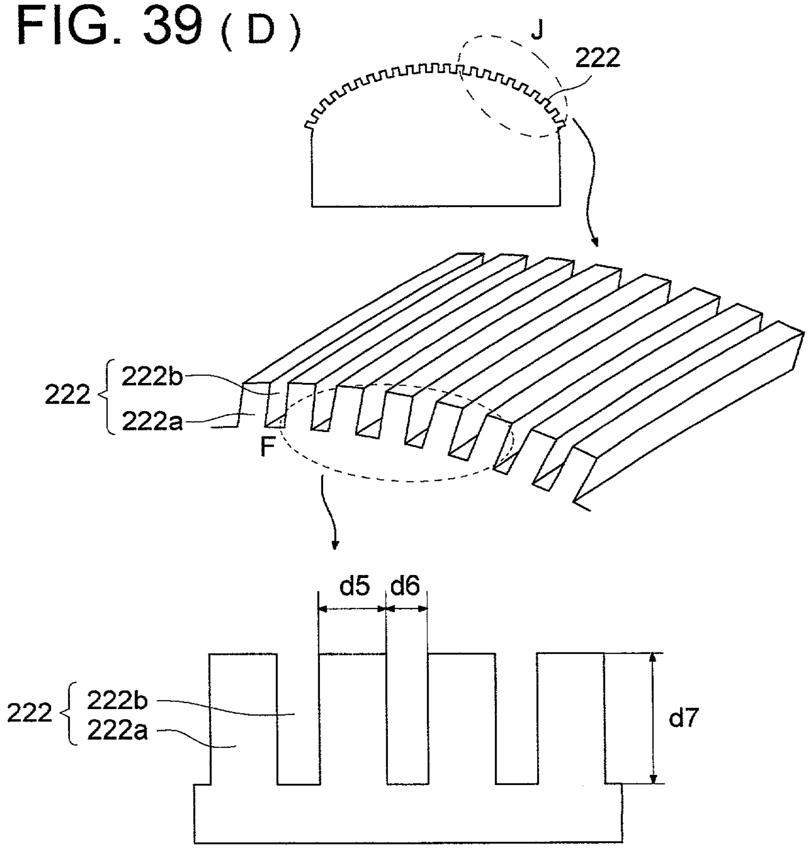


FIG. 40 (A)

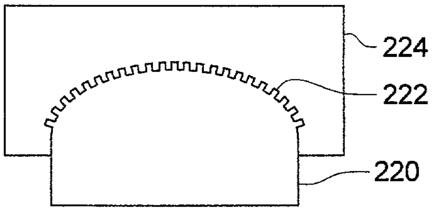


FIG. 40 (B)

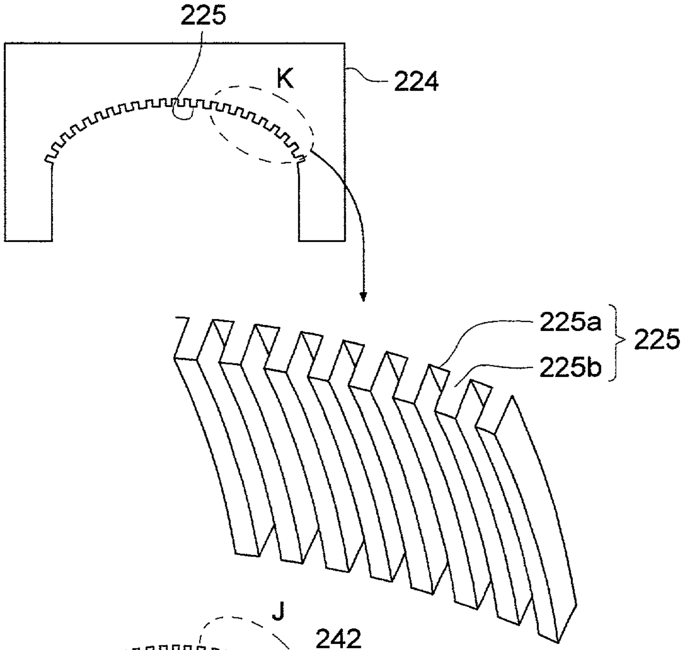


FIG. 40 (C)

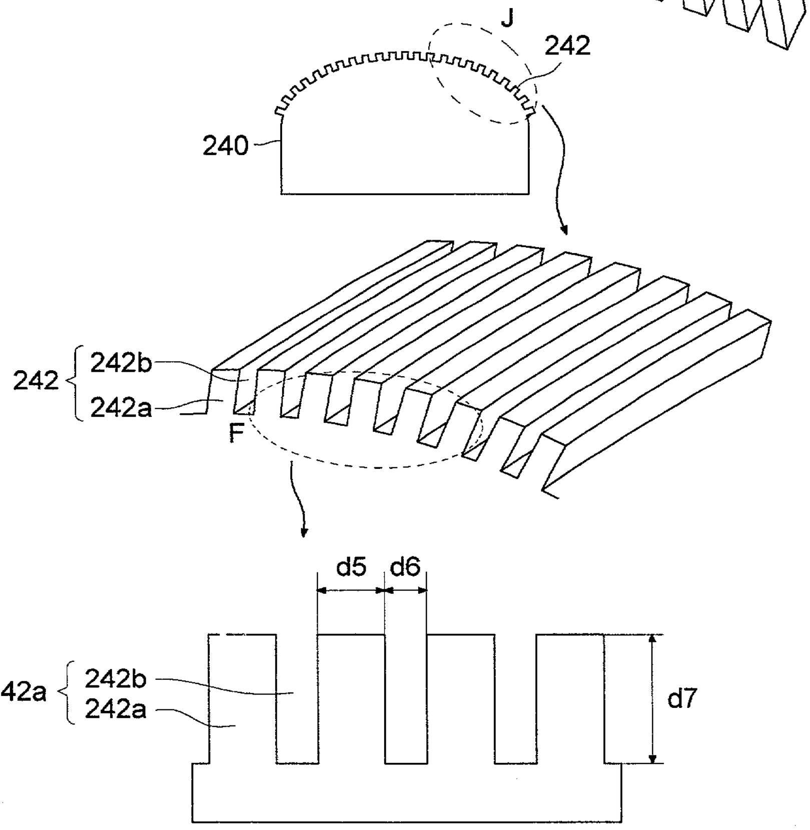


FIG. 41

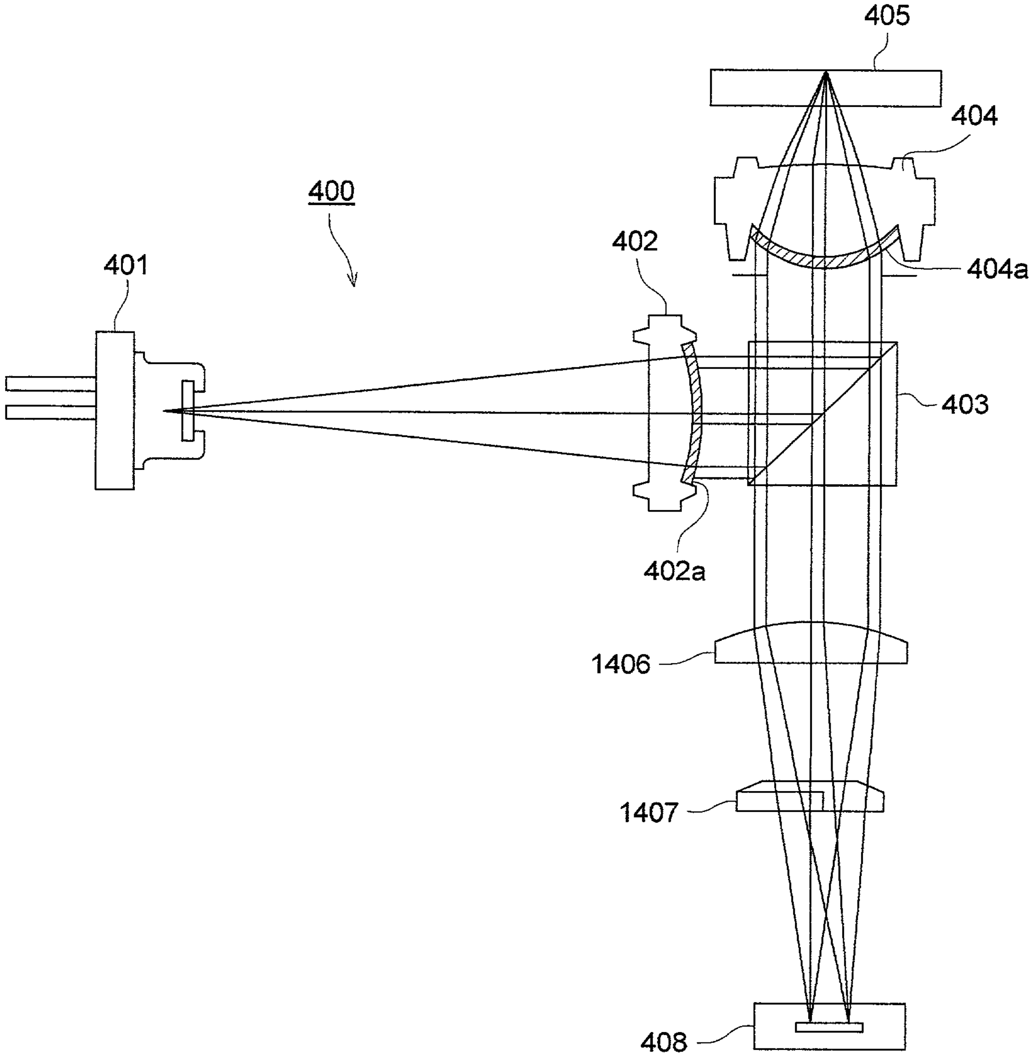


FIG. 42

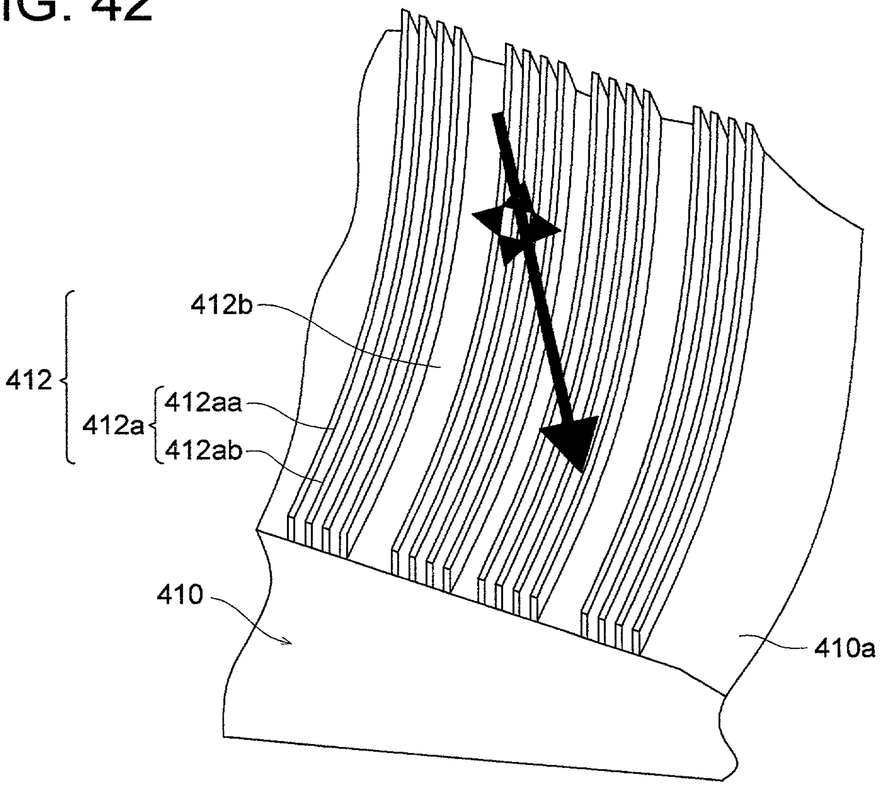

412b
412
412a
412aa
412ab
410
410a

FIG. 43

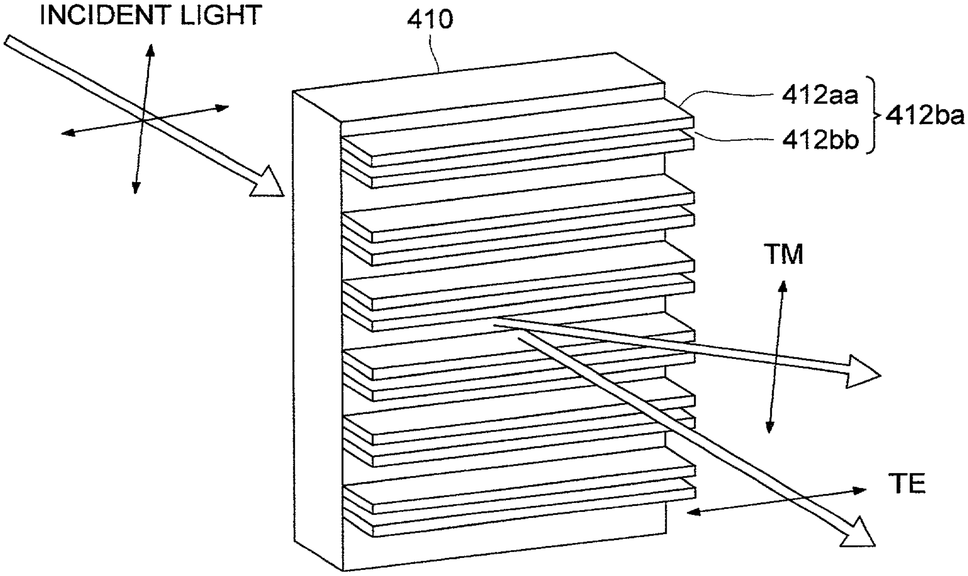

INCIDENT LIGHT
410
412aa
412bb
412ba
TM
TE

FIG. 44

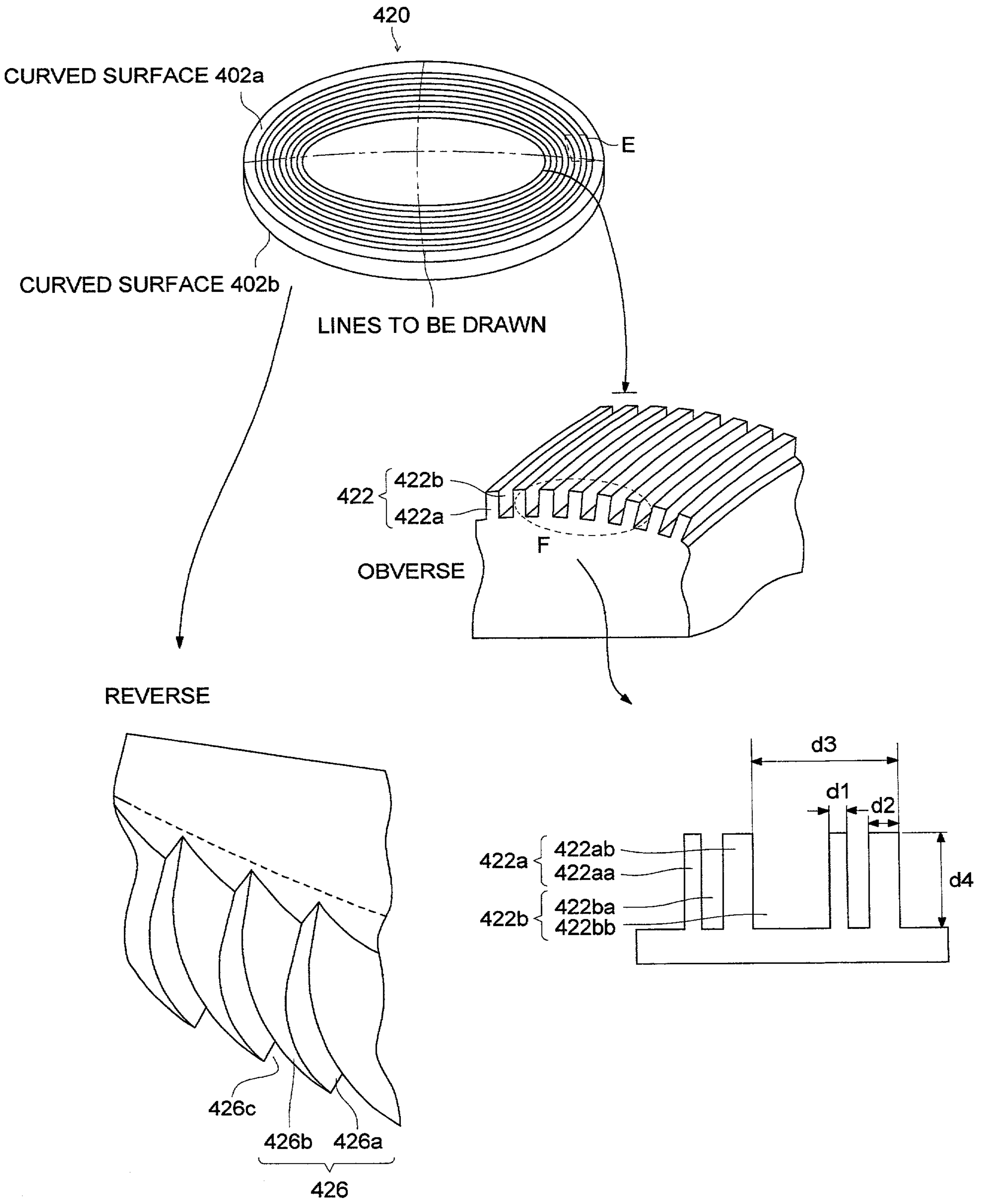

420
CURVED SURFACE 402a
E
CURVED SURFACE 402b
LINES TO BE DRAWN
422
422b
422a
F
OBVERSE
REVERSE
d3
d1
d2
422a
422ab
422aa
d4
422b
422ba
422bb
426c
426b
426a
426

FIG. 45 (A)

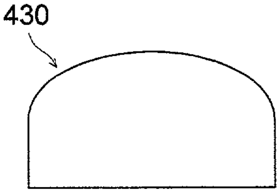


FIG. 45 (B)

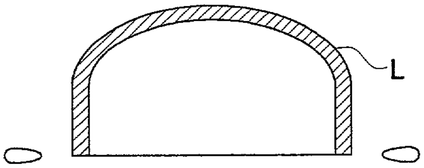


FIG. 45 (C)

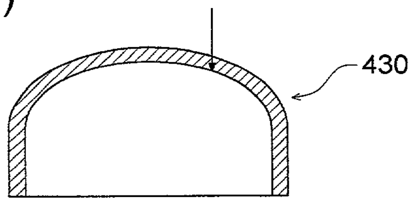


FIG. 45 (D)

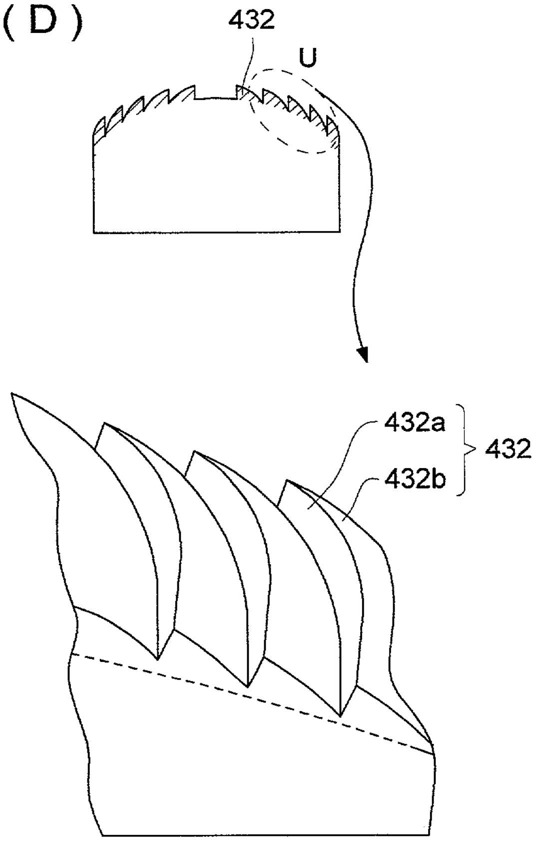


FIG. 46 (A)

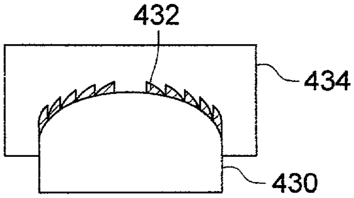


FIG. 46 (B)

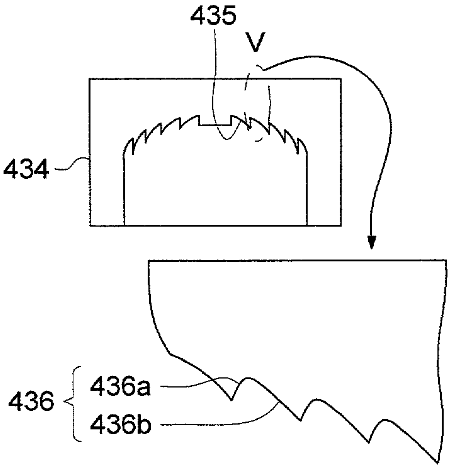


FIG. 46 (C)

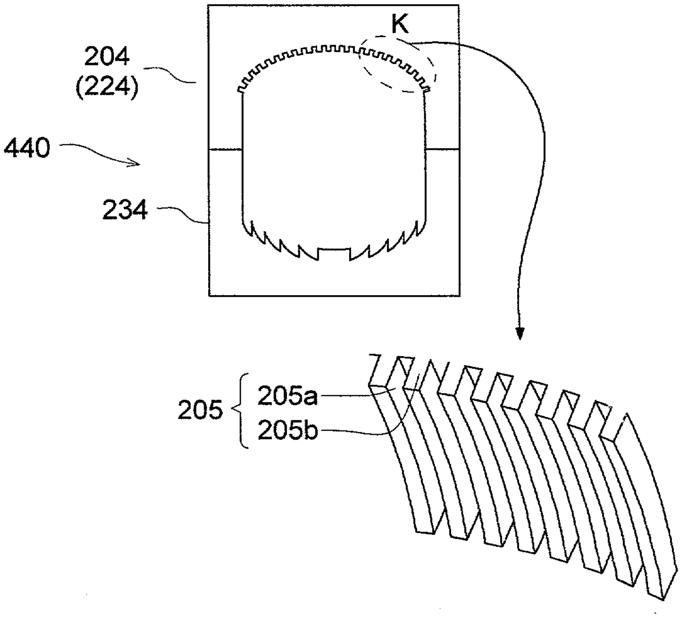


FIG. 47

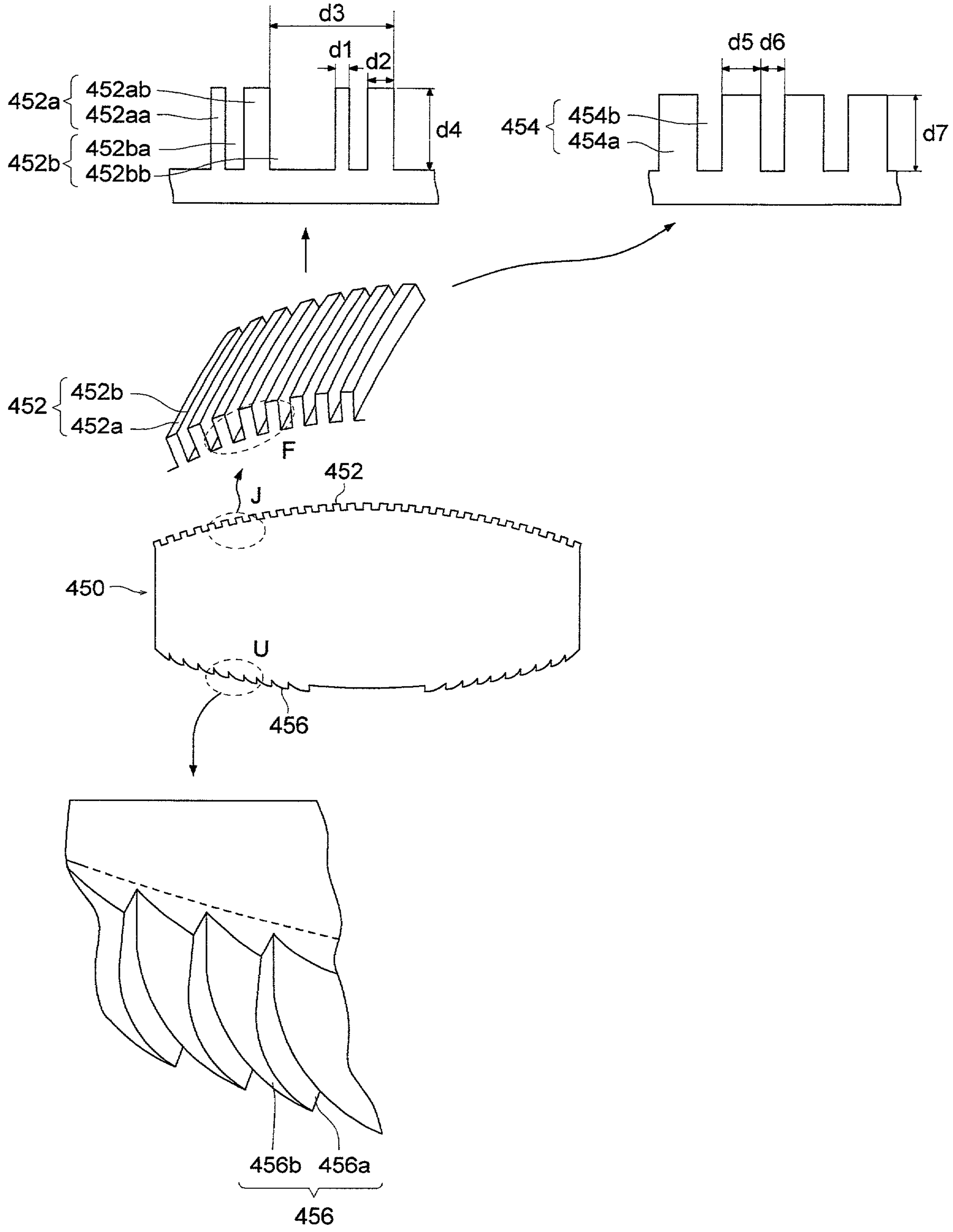

d3
d1
d2
452a
452ab
452aa
452b
452ba
452bb
d4
d5 d6
454
454b
454a
d7
452
452b
452a
F
J
452
450
U
456
456b
456a
456

FIG. 48